UNITED STATES ARMY

JANUARY 1974

AVIATION DIGEST

MAST MUSTS
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UNITED STATES ARMY AVIATION DIGEST

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BG James M. Leslie

EDITOR, U. S. ARMY AVIATION DIGEST
Richard K. Tierney

ABOUT THE COVER

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Articles, photos, and items of interest on Army aviation are invited. Direct communication is authorized to: Editor, U. S. Army Aviation Digest, Fort Rucker, AL 36360.

This publication has been approved by Headquarters Department of the Army, 1 September 1973.

Active Army units receive distribution under the pinpoint distribution system as outlined in AR 310-1. Complete DA Form 12-5 and send directly to CO, AG Publications Center, 2800 Eastern Boulevard, Baltimore, MD 21220. For any change in distribution requirements, initiate a revised DA Form 12-5.

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VANGUARD OF FREEDOM
BICENTENNIAL 1775-1975
UNITED STATES ARMY

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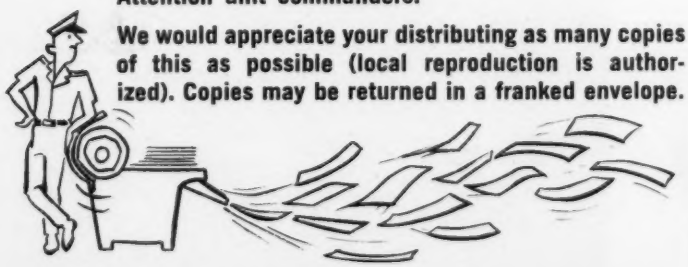

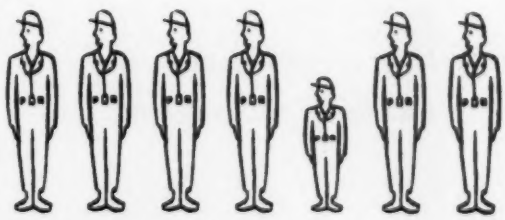

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Above is the official bicentennial emblem which the U. S. Army has adopted to help commemorate the Army's 200th birthday which will occur on 14 June 1975. This logo, in addition to appearing in the DIGEST, will be seen in many other Army publications. It is significant in portraying the beginning of our independence and recalls the gallant, honorable Soldiers who have served through two centuries to endow us with freedom. The following is an account of the magnificent contribution of one such man . . . CW4 Michael J. Novosel

Honor Times 29

William H. Smith
Staff Writer

CW4 Michael J. Novosel was awarded the Medal of Honor for his actions when he saved 29 lives

WHEN DOES A SOLDIER become too old to earn the Medal of Honor? Must he be aggressive by nature and endowed with extraordinary physical powers?

The answers are "never" and

Honor Times 29

"no" to these questions if CWO Michael J. Novosel is an example. Mr. Novosel is not a "young buck." He was a 48-year-old Army aviator when he received the Medal of Honor and became the oldest member of the U. S. Army to win the Medal of Honor in the Vietnam conflict. He is only 5 feet 3 inches tall and is not considered a very strong man. And his gentleness and concern for his fellow man is one of the reasons he earned the Medal of Honor.

"He is the oldest member of the U. S. Army to win the Medal of Honor for his Vietnam actions"

Mr. Novosel earned his medal on 20 October 1969 when he was serving with the 82d Medical Detachment, 45th Medical Company, 68th Medical Group. As a "Dustoff" pilot it was his job to fly into combat areas and evacuate the wounded even though the area was under fire. "Dustoff" helicopters were well marked so that everyone, including the enemy, could tell that the aircraft was on a mission of mercy. Even though he was frequently fired on, Mr. Novosel flew without weapons of any kind.

By late in the day CWO Novosel and his three-man crew had flown several missions. Then the word was passed that helicopters were needed at the Plain of Reeds, Kien Tuong Province near Cambodia's enemy-dominated Parrot's Beak. Three companies of South Vietnamese Special Forces troops had attacked a series of enemy bunkers. The bunkers protected a large enemy training center complete with a model of an ARVN (Army Republic of Vietnam) fire base. Using mortars, rockets, heavy automatic weapons and small arms, the Viet Cong (VC) inflicted severe casualties on the attacking ARVN Special Forces troops. A number of wounded were trapped in an open field exposed to enemy fire.

To get to the wounded Mr. Novosel had to skirt around thunderstorms and then maneuver the helicopter into the heavily fortified area. Without gunships or other cover he flew low until he located the wounded men. By flying in circles over the area where he could land, he signaled the wounded to assemble for evacuation.

When the men had gathered he put down so they could board the helicopter. Although it was apparent that Mr. Novosel was picking up wounded men, the enemy opened fire with heavy automatic weapons, forcing him to lift off. Instead of leaving the area, however, he returned from a different direction. He did this six times until all of the wounded were aboard.

As he was about to leave the last time, Mr. Novosel noticed another wounded soldier near an enemy bunker. He realized that he could not help but to attract a hail of fire flying to rescue the soldier. To minimize this fire he hovered the helicopter backwards to the wounded man. As he was pulled aboard, enemy fire damaged the helicopter and wounded Warrant Officer Novosel. All together Mr. Novosel made 15 extremely hazardous extractions and saved 29 lives.

CWO Novosel is one of those individuals who likes flying. Airplanes have been his first love most of his life. But while he enjoys flying just about every kind of aircraft, he particularly likes flying military types—especially if he can be of help to someone while doing it.

On 7 February 1941 when he was only 17 years old he left his native Etna, PA, to join the Army. He thought he wanted to be an aircraft mechanic and soon found himself in the hangars learning the mysterious insides of the beautiful

birds. But the sight of these same aircraft flying through the air quickly changed his mind and he decided that he really wanted to be an aviator.

For some years the great depression had been in full swing. Many young men wanted the free aviation training the Army offered and the Army could afford to be choosy. Physical requirements were rather strict. A flying cadet had to be at least 5 feet 4 inches tall and weigh more than 160 pounds. But World War II had started in Europe and the Army was undergoing a rapid buildup. Somehow Mr. Novosel got himself assigned as a flying cadet even though he was 5 feet 3 inches tall and weighed about 120 pounds.

He received his wings in December 1942 at the Army Air Field at Lake Charles, LA. Apparently he must have impressed his superiors with his natural flying ability because he was made an instructor. Later he became a test pilot at Laredo, TX. This latter assignment gave him the opportunity to fly a wide variety of aircraft.

Being a test pilot was interesting but it did not allow Mr. Novosel to practice what he had been trained to do. The war was in full swing and like every good soldier he wanted to do his part. Finally he got himself assigned to the Pacific theater as a B-29 "driver." Before the war ended he made several bombing runs over Japan.

After the war Mr. Novosel commanded the 99th Bombardment Squadron on Tinian in the Marianas Islands. He left the service in 1949 and opened a restaurant in Fort Walton Beach, FL. When the Korean war broke out he volunteered and completed a course at the Air Command and Staff School. After the war he returned to civilian life as a pilot for Southern Airways.

When hostilities in the Republic of Vietnam intensified, the Air Force was heavy with senior officers. Mr. Novosel was by this time a lieutenant colonel and found it hard to get back on active duty. So he obtained military leave from Southern Airways, put aside his rank and on 26 June 1964 joined the Army as a warrant officer.

His first important mission with the Army, however, was not in Vietnam. In 1965 the United States sent Army helicopters to support units during the civil crisis in the Dominican Republic (see "Santo Domigo Operations," U. S. ARMY AVIATION DIGEST, September 1965). Mr. Novosel was one of the pilots.

After the mission in the Dominican Republic Mr. Novosel went to Vietnam as a "Dustoff" pilot. There he is credited with evacuating more than 2,000 wounded. Before leaving Vietnam he extracted more than 5,500 soldiers and Vietnamese civilians, usually under fire. During his last year in the country he logged 1,407 hours in the air, an average of about 4 hours a day.

Back from Vietnam he took a flight physical and was found to have glaucoma, a serious eye disease. Army doctors were able to control the condition, but it made him ineligible to fly with commercial airlines.

Besides the Medal of Honor, CWO Novosel holds 60 Oak Leaf Clusters for his Air Medal, the Distinguished Flying Cross with 2 Oak Leaf Clusters, the Bronze Star with Oak Leaf Cluster, the Purple Heart and many other awards. After receiving his medal, Mr. Novosel paid tribute to the many other "Dustoff" pilots by saying, "I don't know any 'Dustoff' pilot who wouldn't have done the same thing if he had been in my shoes."

"In Vietnam he extracted more than 5,500 soldiers and Vietnamese civilians, usually under fire . . ."

Concepts And Ideas

The author presents the thoughts and experiments that have caused nap-of-the-earth (NOE) training to be a reality at Fort Rucker, Alabama. The intensive NOE training described here is that given to instructor pilots chosen to attend the U. S. Army Aviation School NOE Course; this is not the Initial Entry Rotary Wing (IERW) 6-hour introduction to NOE flight, which is considerably less demanding

Nap-of-the-earth flying is to the Army aviator what creeping and crawling is to the Infantryman! Both NOE and creeping and crawling take advantage of the terrain to reduce combat losses. While earlier experience in the Republic of Vietnam taught us that flying at altitude was an appropriate tactic, the realities of radar-directed automatic weapons and heat-seeking missiles demand that we change those tactics. Our problem now is to convince aviators who learned their early lessons well that they must change in order to maintain the combat effectiveness of Army aviation.

Shortly before departing Washington and the Army Aviation Directorate, I read Captain Blunt's article on NOE and felt that it was particularly appropriate considering our country's present threats and the capabilities of our aircraft. The message is loud and clear: both from computer simulations and tests, as well as in recent combat experience, Army aircraft must take to the nap-of-the-earth or face unacceptable losses. The 1972 North Vietnamese offensive against the Republic of Vietnam proved this; the recent Arab-Israeli conflict also reflects it.

When the SA-7 heat-seeking missile arrived in Vietnam—together with 23 millimeter antiaircraft weapons—our aviators elected to go NOE and had to improvise as they went. This was because we had not taught NOE in the training base. Our people therefore learned the hard way.

Fort Rucker is the proponent for aviation tactics. While equipment and unit proponency has been assigned properly to a number of branch schools, the overall tactical concepts for the employment of airmobility are developed at this installation. For this reason, we at the U. S. Army Aviation School and Center at Fort Rucker, Alabama, are concerned with turning the Army around tactically to accommodate to the realities of the 1970s. Let's play the most demanding tactics during our training periods so that we can be ready if the worst case occurs. Let's give each aviator the know-how and the techniques to survive BEFORE he has to learn the hard way again.

MAJOR GENERAL WILLIAM J. MADDOX JR.
Commandant, U. S. Army Aviation School

NOE

Captain Richard N. Blunt

GREEN FOLIAGE loomed ahead as the UH-1H slowly came to a hover; somewhere over the riverbed 2,000 meters away another UH-1H was approaching from the opposite direction, gliding through the trees with swift yet cautious movement.

"Buzzard 1, this is Scout, over."

"Go ahead Scout, this is 1."

"Slow mover approximately 2 klicks proceeding your direction. Engage when ready."

Slowly bringing his aircraft just over the top of the trees, Buzzard 1 spotted the invader. He counted off 8 seconds and the kill was complete.

What you have just read describes a part of the action of nap-of-the-earth training being conducted by the U. S. Army Aviation School (USAAVNS), Ft. Rucker, AL.

The concept of NOE is to successfully navigate and operate at NOE altitude against a mid-intensity threat. It is designed to enable the helicopter to survive in a mid- to high-intensity battlefield with more than marginal success. This entails successful avoidance of detection which would allow ground fire and sophisticated missilery to engage.

In the last 4 years numerous test experiments indicated that the average Army aviator today cannot possibly survive in this low NOE flight profile without extensive and formal training.

Continuation was provided in theory by the U. S. Army Com-

"... while the aircraft came to a hover over the riverbed, the enemy aircraft approached through the trees..."

A map recon of the terrain and obstructions is essential during preflight planning

bat Developments Experimentation Command (CDEC) Experiment 43.1 "air-to-air" which was conducted at Hunter Liggett Military Reservation, CA, in 1970-71. It consisted of air-to-air exercises which pitted a high performance aircraft, F-4 Phantom, against an AH-1G attack helicopter. The experiment revealed that the helicopter operating in NOE flight was easily camouflaged against the terrain, and obviously hard to detect. Also, whenever detection *was* made, the attack angle of the high performance aircraft was steepened to such a hazardous degree that proper engagement was not feasible.

Looking at this experiment in retrospect, one can imagine the pros and cons of pitting the attack helicopter against high performance aircraft. This experiment was not designed to perpetuate that means but rather to determine the effectiveness of the nap-of-the-earth operations. At USAAVNS, the tactical training exercises that have evolved teach the student the techniques of low level operations.

All tests involving nap-of-the-earth techniques were conclusively positive in confirming the feasibility and necessity of NOE flight. Now, this is not to say that nap-of-the-earth flight will solve all existing problems of mid- to high-intensity warfare; rather, it is the start of a tactical doctrine in concept and theory to provide the stepping stone to greater understanding and insight in this area.

We can and hope to accomplish and fulfill the training necessary to be able to cope with the advanced technology and weapons systems which may confront us in the future.

Army aviation training is now in a period of evolution. In the assessment of priorities, the paramount need for NOE training should be recognized when contemplating the capabilities of possible future opponents: their capabilities indirectly dictate our doctrines, tactics and training. Currently, indications are that the forward edge of the battle area (FEBA) will require NOE flight to evade detection by radar and attack by ground fire and sophisticated missilery.

The overall trends and developing concepts indicate that Army aviation will be a critical and decisive element in the total combat power for the commander on either a conventional or nuclear battlefield. A main teaching point of the nap-of-the-earth course is that Army aviation must be identified as an integral part of the combined arms team. Therefore, to relate to this theme, the aviator must be knowledgeable in the total organization and operation of the combined arms of which he is a part.

Too many times in the past aviation and the combined arms have stood in total ignorance of one another's capabilities. It is the concept of NOE to provide the incentive to reciprocate new lines of thought with the combined arms and to interject the integrity needed so much to perform the mission.

In the latter part of 1971, a cadre of 16 instructors began NOE training at Ft. Rucker by the (then)

Aviation Armament Evaluation Branch. These 16, after acquiring their NOE instructor qualification, in turn trained an additional 160 pilots from June 1972 to June 1973 to be NOE instructors for the Department of Advanced Flight Training (now called the Department of Undergraduate Flight Training). These IPs will be responsible for teaching initial entry rotary wing students NOE which effective last March became a part of the student curriculum.

Initial training for the NOE student begins with the academic phase, where map reading and terrain interpretation is particularly stressed because it is imperative that the aviator perform these functions as though they were second nature to him. Why? Because NOE flight, as close to the ground as terrain and obstacles will allow, requires interpretation of terrain features in an entirely new perspective. Thorough map reconnaissance prior to flight is essential for successful NOE navigation. It is impossible to visualize flight at this altitude merely by glancing at a chart beforehand, and while flying as low as terrain obstacles permit it's inadvisable to concentrate on a map.

Navigation must be accurate so that the aviator can fly within a corridor 100 meters wide and still give his location in 8-digit coordinates at any time; this is to ensure the aviator remains oriented and gains positive recognition by friendly forces in the FEBA where artillery assignments and other activities are all confined. An additional requirement is thorough knowledge in the use of communication and electronic operating instructions (CEOI) for radio communications. The security of communication is an evident need in forward areas . . . lack of security is an invitation to disaster. With secure communication the aviator gets information upon which he can rely. He then determines how to cope with circumstances concerning the enemy.

In addition to navigation and communication security, a third major area of training for NOE encompasses a fine blend of prior learning and tactical sense (i.e., mid- or high-intensity). During this training the individual aviator learns the value of becoming a part of the total force as opposed to the individual support role. He will be taught to provide sound information or make suggestions to division level or higher according to the situation; decisions that evolve could well affect the outcome of any given battle in which he is involved.

The flight phase consists of about 15 hours of dual instruction with individuals graduating on a proficiency basis. During this phase the instructor must impress the seriousness of this particular training due to the critical nature of effective NOE. While in flight the aviator is taught to navigate within 100 meters of a preplotted course; as he gains proficiency the instructor pilot adds simulated tactical situations similar to those which will confront the NOE student.

The aviator learns all aspects of NOE, i.e., resupply, medevac, troop insertion, reconnaissance and attack. Throughout the training the aviator uses proper radio procedures and CEOI usage to ensure security and also that he not confuse other elements of the combined arms force with aviation slang. At least one flight period will be devoted to an air-to-air problem in which the aviator demonstrates his ability to tactically evade or destroy enemy aircraft (helicopters) with previously gained knowledge. He will be given problems on photo map use and reconnaissance, with one full period devoted to missions directly from an unmarked aerial photograph.

During the flight phase, it is anticipated that misunderstandings or shortcomings of students will be identified such as:

• *Misconceptions of nap-of-the-earth flight based on Republic of Vietnam combat experience and low level flying:* Most aviators have the initial "Well, what's so new about that? I did it in Vietnam for a year" attitude. As discussed here, NOE concerns flight as low as terrain obstacles will allow. The aviator's experience in Vietnam was likely in the areas of 50 to 100 feet or higher.

• *Limited background knowledge of map study, reading and usage:* Vietnam veterans, we have found, are too reliant on the "pop smoke" concept and use of terrain interpretation has been a small part of any prior map reading experience.

• *Poor knowledge of aircraft limitations and use of aircraft performance charts:* By the way, when was the last time you looked into performance charts for your aircraft? How high will you be able to hover out-of-ground effect? Do you know where to look? Answer those questions truthfully and see how you measure up.

• *Students becoming so involved with the tactical situation that their aircraft control is marginal:* This error is the easiest to make due to the necessary realism in NOE training; the problem *must be* stressed to instructor pilots and students alike.

• *Limited background of proper radio procedures and CEOI usage.* How long would it take you to verify a unit while flying in combat? Have you ever heard "Roger that " and "Tally ho" on the radio? There is no place for slang in a combined arms maneuver.

• *Last . . . safety:* This unfortunately involves the most argument. Safety is not forgotten in NOE flight, rather it is stressed as imperative (see "Nap-Of-The-Earth

In the NOE environment, teamwork is vital—the copilot must relate his map to the terrain and help the pilot in navigation in the nap-of-the-earth

Flying," June 1973 DIGEST). The aircraft must be in perfect condition, checked by preflight and postflight inspections. Armored seats are a must to protect the aviator in the event of a crash. In addition, such improvements as crashworthy fuel system and low glare windscreens add to the safety of the aviator.

Some aircraft may be lost in NOE training, but the number lost in actual mid- to high-intensity conflict will be dramatically reduced if aviators are trained *now* for that situation instead of adapting slowly as was the case in the Republic of Vietnam.

In the August 1972 issue of ARMY AVIATION the following excerpt appeared concerning Department of the Army guidance to commands: "Recent Vietnam combat experience and aircraft survivability test results have revalidated Army doctrine concerning nap-of-the-earth (NOE) flight as a means of enhancing aircraft survivability in mid-intensity combat environments." With this fact already established, the Army is now confronted with the most essential aspect of nap-of-the-earth flight . . . *command emphasis.*

There is skepticism about actual NOE training because of the increased safety factor involved, but the fact is the U. S. Army Agency for Aviation Safety (USAAAVS) feels NOE flight is practical and when done properly is no more hazardous than any other flight. As we have predetermined, NOE flight is critical to the mid-intensity battlefield, and commanders even at the unit level must properly supervise and control the training to ensure the most successful accomplishment of individual missions.

How can commanders conduct NOE training and still ensure minimum loss of aircraft and pilots? First and foremost in their minds should be carefully planned training programs that are supervised by the commanders with equal care. These programs will in the long run save many lives and increase the Army's ability to execute advanced airmobile concepts. Some points for commanders to consider when establishing these programs are:

• In the selection of training areas and routes to be used, the first consideration is the safety of men; the equipment; and the terrain involved. Routes should be flown by experienced pilots qualified in NOE tactics prior to actual training of students. Once the instructors have become familiar with the routes, a hazard map must be compiled indicating all existing hazards to flight such as wires, towers and other perils. Commanders need to predetermine that such hazard maps are updated and reviewed daily by their pilots.

• The second consideration is the command and control (C&C) of aircraft engaging in NOE flight. C&C can be easily accomplished from an aircraft overflying the routes at altitude (500 to 1,000 feet is recommended) to observe and over-

see the low level aircraft. It is the responsibility of the command and control ship to prevent the training aircraft from converging and overlapping courses. Furthermore, C&C would monitor any difficulties such as disorientation or communication failure.

• The third consideration is the practicality and realism of selected routes. To be practical, routes must not emphasize the use of man-made features. They should be designed to use natural terrain features such as valleys, spurs, saddles, draws, etc. For realism these routes should be created to allow the aviator to realize the advantages of flying NOE to avoid detection and vulnerability. By following draws and circumnavigating hilltops, for example, the pilot learns to appreciate the concepts of masking and unmasking.

• The last consideration encompasses commanders' roles in establishing, administering, enforcing and reinforcing the NOE training program. They must be thoroughly convinced of the necessity of NOE flight, and readily and wholeheartedly supervise their NOE programs. Some safety records might change but the accident rate does not have to go up if NOE is supervised properly. The long range advantages will more than console discouraged commanders. Unit commanders should fly command and control aircraft to personally view the routes selected, the tactics employed and to simultaneously monitor instructor pilot proficiency; they should also fly the low ship to gain a better appreciation of the problems associated with NOE flight. This will assist them to be adequately capable of reinforcing the NOE program with suggestions and criticism. Moreover, commanders will be more knowledgeable and better qualified to control their unit's program of NOE training.

Army aviation is always ready to pursue new challenges or face seemingly insurmountable odds and perform well. At Ft. Rucker NOE is a reality; however, it was a challenge renewed in 1971. NOE must be the next most important step in the total development of Army aviation's assets.

EACH OF US has at some time felt as though he may have slipped out of the wrong side of the bed . . . perhaps shouldn't have gotten up at all . . . and as a result spent the whole day behind the power curve. Wouldn't it be nice if such moments were predictable . . . even preventable. The accompanying article, in addition to being entertaining, is certainly imaginative and thought provoking. The author has taken an intricate concept that is difficult to explain and turned it into enjoyable and interesting reading. However, a serious word of warning is in order. One can easily be falsely led into believing that much of what is speculated about measurable and predictable biorhythms has actually been thoroughly, systematically and scientifically investigated. This is *not* the case.

Much of what is presented is hypothetical, having little to support it in scientific fact, and being largely supported by someone's personal and uncontrolled observations. Nevertheless, several military aviation safety publications, popular magazines and books have expounded these hypotheses, thereby lending undeserved credence to their soundness *without seriously questioning the practicality of their application or more importantly their actual or potential validity.* To believe in the existence of mechanically rigid, mathematically predictable biorhythmic cycles in humans smacks of astrology and could terminate in unbridled superstition. Thus, it is vital that Army aviation personnel read such material in the proper perspective.

While for the most part the planets, stars and other heavenly bodies move with mathematically predictable determination and calculable precision, this is seldom the case for man. Psychologically and physiologically man is often an incalculable and veritable enigma. *His trademark is variability* . . . relative unpredictability . . . no one individual is exactly the same as anyone else, nor does he react or respond consistently the same as he did at any respective point in time. Man is a complex, influenced not only by his own variability but also that of his environment. To suggest that his activity could be reduced to three basic never waivering, exactly predictable, birth initiated rhythms is unsophisticated and certainly conflicts with the reality of existing medical knowledge.

Two excellent examples exist. Most of us are aware of the nature of the female menstrual cycle to some extent. While medical texts allude to this as a 28 day cycle, every physician knows there is normal and abnormal variation around that mean value. In addition, such cycles frequently are altered or terminated by changes in mental state, physiological state, hormonal variation, nutrition, drugs and other factors. It is unlikely then that the hypothesized cycles would remain predictably timely from the point of birth. Many of us are also familiar with the circadian rhythms or the body's natural clock. This forced, daily, 24-hour rhythm that *has* been scientifically confirmed is significantly upset by mere physical displacement upon the earth's surface . . . by simple disruption of the day/night cycle. Can you then believe that one can calculate the intercept of three separate and distinct cycles at any given point in time by merely knowing one's date of birth?

What about accident statistics? (Particularly those reflected on page 17 of this article.) Why is it that favorable and ominous occurrences can be shown to coincide with the expected cycles so often? *Statistics can be misleading!* Special types of statistical analysis are required to demonstrate associations that are significant. Too often there are hidden, confounding and confusing variables that muddy the waters of reality. As an example, let's say a large percentage of aviators involved in crashes smoked a filter tipped cigarette within 2 hours prior to their accident. The likelihood that this could be demonstrated as often as a critical cycle is pretty strong. Why not attribute the accidental event to filter tipped cigarette smoking then?

With respect to the accident statistics in the accompanying article, many questions can be raised about the nature of control data. What about the cycles of those pilots who had accidents whose rhythms were not critical or were perhaps even favorable? Why did they crash? Also, how did the group who had accidents compare with normal flying control aviators who had no accidents? Were their rhythms critical or favorable to the same extent? Without this data one can hardly speculate on the meaning of the existing data. The data is interesting, but completely inconclusive, and likely to be misleading to those who have little training in statistical analysis.

Take heed then! Realize the definite limitations of this thought provoking hypothesis. Perhaps future scientific investigation will permit identification and characterization of measurable cyclical patterns that coincide with those subscribed to in the article. Then perhaps a sophisticated computer analysis could determine with reasonable predictability the risk of accidents on a given day among certain aviators. Till then, just sit back and enjoy the article. Calculate your cycle . . . titillate your curiosity. But, leave the calculations at home . . . dispel any superstitious thoughts . . . keep your tongue where it belongs (in your cheek) . . . and get back to the serious work of flying carefully and safely.

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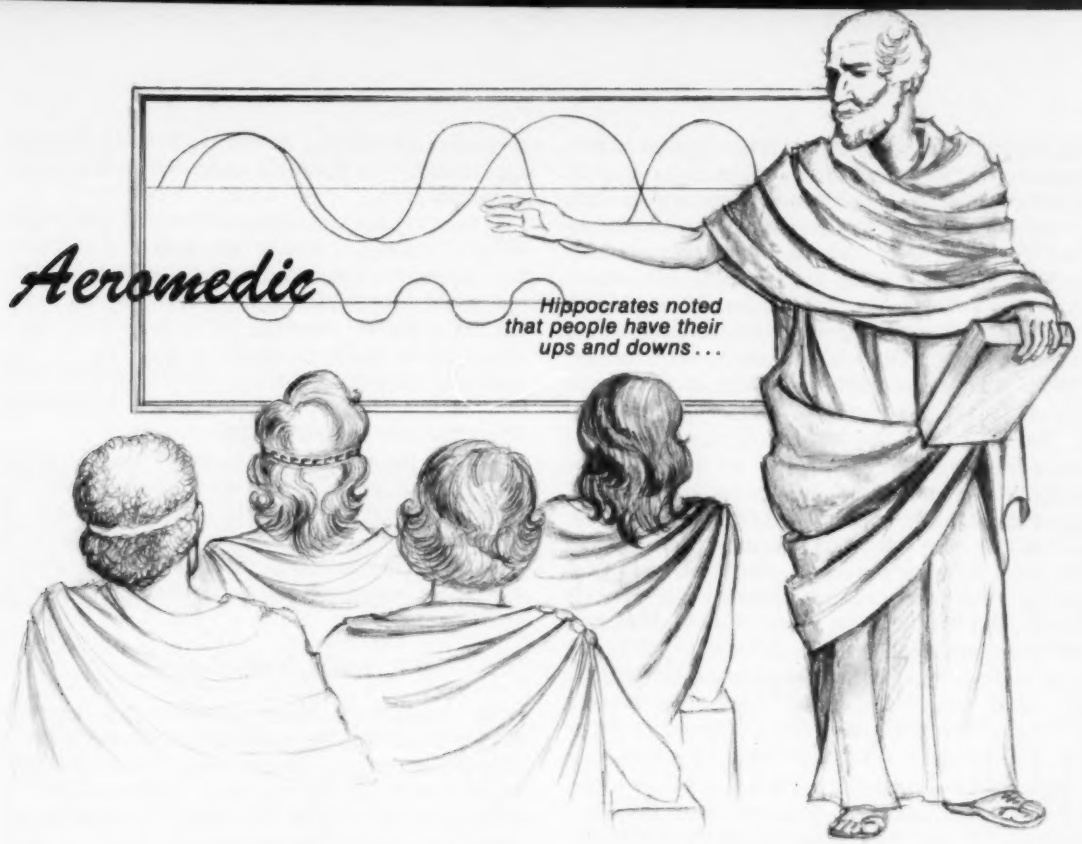


BIORHYTHMS

The Question Of Ups And Downs

Major Carl A. Weaver Jr.
U. S. Army Aviation School

TWO THOUSAND and four hundred years ago, Hippocrates made an interesting observation. He noted that people had their ups and downs. As a result of these observations, he advised his medical students to take these fluctuations into account in the treatment of patients. I am certain that you have also recognized your own good and bad days as well as those of your friends.

You are about to read an extraordinarily interesting explanation of the nature of ups and downs. As you read further, however, you must keep an open mind because the explanation is a hypothesis. It lacks sufficient evidence to allow its general acceptance as a theory. But there is a significant element of proof to support the contention that people do have ups and downs in a cyclical pattern, as you can read below.

Every pilot has had *those days* when he can't do a thing right. He lacks endurance, energy and confidence. He seems to have little resistance to physical demands. On such days he fails to take that extra care preparing his flight or completing a checklist. These are the types of days when he might bounce one in—or forget to turn on that one important switch.

In contrast, there are *those days* when a pilot feels as though he can lick the world; everything clicks together. He is physically durable, cheerfully confident, intellectually creative, alert and full of logic and reasoning. It is on these types of days that he greases one in and doesn't miss a single task.

Since the days of Hippocrates, many others also have studied the problem. Then in the late 1800s man actually became aware of the importance of

what Hippocrates was saying. On a grand scale, cycles or rhythms were related to galaxies and to the solar system. Researchers also frequently noticed the repetitious, regular-interval level of activity in living things. Rhythms or cycles have been cited as characteristics of the living world. In fact, living world rhythms are the subject of a recently developed branch of biology known as biorhythmology. This branch is concerned with the entire spectrum of rhythms found in plants, animals and man.

Nearly everyone who has traveled rapidly across two or more time zones is familiar with the body's need to regulate itself and correct for the change in spatial orientation. This is due to the timing mechanisms that cause certain functions of the body to be cyclical in nature. That is, the functions rely on sequences of events which repeat themselves at regular intervals. The most commonly known cycle is the circadian rhythm which is about a day in duration. The circadian rhythm is associated with the 24 hour cycles of the body heart rate, temperature, blood pressure, sleep and the like. Less commonly known, however, are the rhythms which are longer in duration. This article is about those longer rhythms.

One of the early pioneers in the study of biorhythms and their application to man was Dr. Hermann Swoboda, professor of psychology at the University of Vienna. During the 1890s his interest focused on several fields of study. One was the law of regularity; another the cycle of birth; and a third was a study dealing with the bisexuality of man. The results of these studies coupled with the results of his own research findings prompted him to wonder whether there might be some definite regularity to the fundamental changes in man's disposition as suggested by Hippocrates and others.

Dr. Swoboda's research efforts became intense following the turn of the century. Early efforts revealed that fevers, swelling and pain were rhythmic in nature. Similarly, he conducted research in the field of human psychology and began to note periodic intervals generally based upon either 23 day or 28 day rhythms. In his search for the answer to these rhythms, Dr. Swoboda noticed that his patients had greater physical resistance for a period of time followed by a period characterized by slower progress and lower resistance.

Unknown to Dr. Swoboda, a German contemporary was conducting similar research and making similar observations in Berlin. Dr. Wilhelm Fliess independently discovered the same 23 day and 28 day rhythms in man. Dr. Fliess was assisted by a mathematician and together they concluded that these rhythms could be traced throughout life. Dr. Fliess also observed that the 28 day rhythm corresponded approximately to the lunar cycle and to the female menstrual cycle.

A third rhythm was discovered around 1920 when Alfred Teltscher, a teacher and doctor of engineering, noticed that his students seemed to have intellectual ups and downs. Through his own research, which included statistical sampling, he concluded that intellectual performance fluctuated in a definite 33 day cycle. By 1930 researchers in the United States had become interested in biorhythms and accidentally discovered the 33 day rhythm.

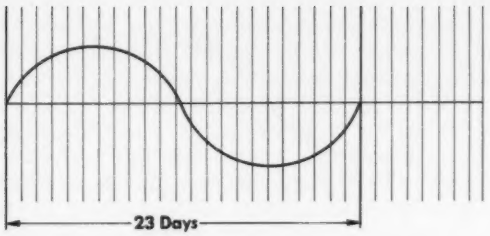
Despite the efforts of Swoboda, Fliess, Teltscher and others, it was not until after World War II that general scientific interest in physiological clocks was intensified. This intensification can be attributed to rapid transit developments, the introduction of worldwide instant communications systems and the advent of mechanization.

What Is A Biorhythm?

The biorhythmic theory postulates that there are at least three basic life rhythms that rise and fall at a regular pace in each human being. The biorhythmic theory further assumes that these rhythms contribute to our physical abilities, our emotional reactions and intellectual capabilities. Biorhythms begin at birth. This coincides with the time at which independent life begins. It is the time that the heart beat, blood flow, breathing, nutrition and many other body functions become the responsibility of the new infant and its organs. All three known biorhythms start off together and for the remainder of the person's life a different relative combination of the three rhythms appears each day.

The 23 day cycle is known as the "physical" or masculine rhythm. It represents physical strength, physical endurance, energy, resistance and confidence. Dr. Fliess believed this rhythm originated in the fibers of the muscles. The first half of the cycle is the discharge period where a person feels vigorous. During this portion of the cycle a person normally performs physical tasks with ease. During the second half of the cycle a person is in the recharging period. During this portion of the cycle a person goes through a period of recuperation and is susceptible to tiring easily and he is usually lacking in vitality and energy (see figure 1).

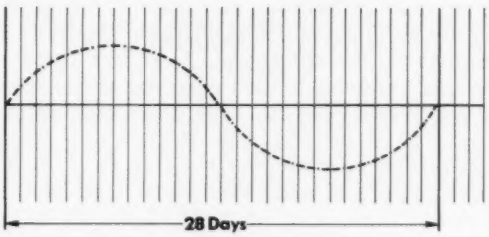
The 28 day cycle is known as the "sensitivity" rhythm. Due to its approximate correlation to the female menstrual cycle, it is known also as the feminine rhythm. This rhythm represents a cycle governing sensibility, nerves, feelings, intuition, cheerfulness and moodiness. It is this rhythm that influences man's



23 day physical rhythm cycle

Figure 1

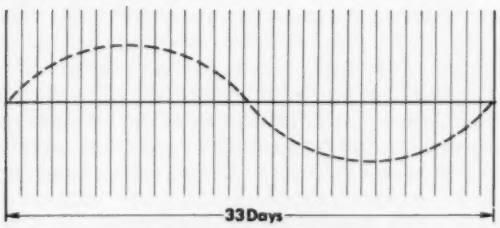
creative ability. The first half of the cycle is similar to the physical rhythm described above in that it represents the discharge period for emotions where the individual is in high spirits. During the second half of the cycle a person is more likely to be in a bad mood and easily irritated (see figure 2).



28 day sensitivity rhythm cycle

Figure 2

The third biorhythm is a 33 day intellectual cycle. During the first 16½ days of this cycle a person's memory is usually keen, he is very alert, displays logic, reacts with reason and is rather ambitious in his thinking. During the second half of the cycle one may find himself forgetting little things, lacking in the ability to intensely concentrate and his mind wandering (see figure 3).

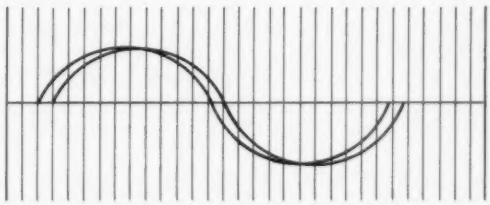


33 day intellectual rhythm cycle

Figure 3

At first glance it would appear that the critical periods are those that show the curves below the median. This is not altogether true. It is the point at which the curve crosses the median from plus to minus or vice versa that is critical. It is at this time that the system represented by the curve is in a state of limbo. The system is neither active (discharging) nor resting (recuperating). The point at which a rhythm curve changes status and crosses the median is known as the critical day. These are the switch point days and must not be considered critical in themselves. They are, however, days when a person's reaction to his surroundings (because of his biorhythms) may bring about a critical situation. On the other hand, the position of the curve or curves below the line offers an explanation to the "bad" day feelings that we have all experienced at one time or another.

A critical day represents a period of about 24 hours. The starting point of the curve, therefore, becomes important to the exact plot of a critical day. If the person is born close to midnight his biorhythm plot would be slightly different from one that represents his birth if it were just after midnight. Knowing the exact hour of birth allows for more accurate plotting of one's biorhythms (see figure 4).



In this chart one line was drawn to represent a cycle beginning with a birth during the early hours of the day. The second line shows the rhythm line for a birth during the late hours of the same day

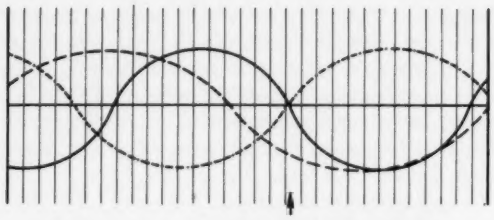
Figure 4

Application of Biorhythms

Biorhythms may be plotted in any number of ways. For the purpose of simplicity, the sine curve is used by George Thommen, a well known researcher in biorhythmic theory, and other experts in the field. During the pioneer days of the study of periodicity, Dr. Swoboda designed a calculator so that the critical days could easily be found. He designed the hand-held, rapid calculator in hopes of encouraging physicians and others to use and experiment with the biorhythmic theory. There are still several calculators on the European market today, but none of them provide the advantage of the sine curve. The sine curve, unlike the calculator, provides a visual presentation of the entire oscillation of the curve or curves in question.

When all three curves are plotted on the same axis with respect to the subject's birthdate, the position of one curve can be determined in relation to

the other two. Their relative positions reveal several things. As stated, a critical day is indicated by the point at which a curve crosses the median line or axis. Superimposing the three curves readily shows double or even triple critical days (see figure 5).



Superimposed curves with a double critical day

Figure 5

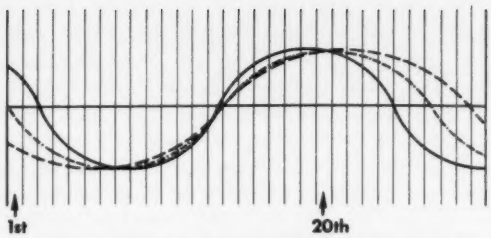
When all three curves are below the line or median, the subject is susceptible to becoming easily tired, moody and not very alert.

The obvious attraction to this type of presentation is that it provides the untrained reader an "explanation" for past events. Similarly, the charts may be bad for the untrained reader who becomes carried away due to the chance of autosuggestion. This situation might in some way cause a person to feel low if you show or tell him that he is supposed to feel low.

According to the biorhythmic theory, each of us is supposed to have—at the most—11 critical days per month. Of course double and triple critical days arrive with less frequency. The three biorhythms come back to the starting point on the median in the position they were in at birth after 58 years and 66 days. Aside from the obvious attractions and distractions of the rhythm charts, there are three definite applications for the biorhythmic theory—planning or decision making, medicine and safety.

Planning with regard to biorhythms has the potential of being extremely effective. Consider the person responsible for the planning or scheduling for someone whose activities require an unusual degree of physical strength or coordination, i.e., a boxer or a competition weight lifter. Similarly, a planner can take biorhythm charts into account when unusual degrees of concentration are required as is necessary for decision making. To illustrate the planning application, examine the biorhythm chart for the astronaut who landed the first spacecraft on the moon on 20 July 1969 (see figure 6).

There is no need to explain the obvious physical and intellectual concentration required to accomplish the moon landing. As everyone knows, the moon landing was highly successful. Note in figure 6 that



July 1969 biorhythm chart for Astronaut Edwin E. Aldrin Jr., born 20 January 1930

Figure 6

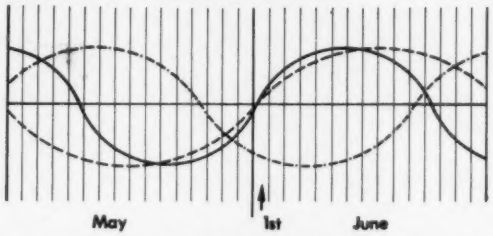
the date Astronaut Edwin E. Aldrin Jr. set foot on the moon coincided with a "peak" period on his chart.

A second application of biorhythmic theory is in the field of medicine. Medical application is fairly well documented because until recently most biorhythm research has been accomplished for medical purposes or in a medical environment. Medical applications are rather obvious; operations could be scheduled according to the biorhythms of the patient and the operating surgeon. Consideration should also be given to the position of the rhythms with respect to the postoperative period of recovery. Dr. F. Wehrli of Switzerland has used biorhythms in his hospital for more than 15 years. He reports that there has not been a failure or complication in more than 10,000 operations.

A third area to which the biorhythmic theory is applicable is that of safety. Studies by safety consultants and insurance companies have shown that 70 to 80 percent of all accidents occur on critical days. According to Thommen, a recent study by R. K. Anderson Associates shows that 70 percent of the 300 accidents charted in four industrial plants occurred on critical days.

Accidents are most likely to occur when the physical and sensitivity cycles are at critical points. That is not to say that accidents won't occur on other days, only that they are *more likely* to happen when a person is not up to par emotionally or physically. The following experience reinforces the accident theory as it pertains to biorhythms. A friend of mine went on vacation recently. His enthusiasm was high because he had just purchased a new automobile that was sure to make the trip more enjoyable. Upon his return I routinely asked him how his trip had gone. He related to me how things were hectic as he prepared to depart. He then proceeded with a 5 minute dissertation about how annoying drivers are these days. He told me how he had been confronted by one annoying driver who caused him to wreck his new automobile. His story went on to describe

that while his car was being repaired, he was in high spirits and had accomplished a great deal of personal business to include the sale of his house and the entrance into a lucrative business partnership. Because of my newly acquired knowledge of the biorhythmic theory, I plotted his chart for the end of May and the beginning of June. The results were interesting to say the least (see figure 7). The subject, born on 2 March 1940, wrecked his automobile on 1 June 1973, a double critical day.



Accident related double critical day for the months of May and June; subject born 2 March 1940

Figure 7

Now that biorhythms have been tied to accidents, you probably wonder if there is an application to aviation safety. It has been reported that one European airline has maintained an excellent safety record for more than 20 years with the aid of biorhythms.

Plotting biorhythms permits you to check past events. I used this technique to examine Army aviation accidents for the past 2½ years. With a relatively large sample of one-fourth of the pilot error accidents not related to materiel failure, I plotted the biorhythms of the pilots. Nearly half, or 49 percent, of the accidents clearly occurred on a critical day. More than 64 percent of the "critical" day accidents happened on double critical days. There were numerous accidents not included in the 49 percent which occurred when all three cycles were low or when the incident was bracketed by critical days before and after.

Just as you can examine the past, you can also prepare for the future. The plotter of biorhythms can chart his future and remember to exercise special care on critical days. Since many other factors influence accidents, no ironclad predictions can be made. You can take advantage of the biorhythm system by warning yourself in advance to "be extra careful today."

No discussion of biorhythms is complete without an introduction to at least one method of computation. Basically, to compute the location of a curve on a particular day, it is necessary to add up all the days a person has been alive to that point in time. The next step is to divide this total by 23 for the masculine rhythm; by 28 for the feminine rhythm; and by 33 for the intellectual rhythm. You must remember to add a day for each year that is a leap year except for the years 1800 and 1900 which are special cases in the 4 year cycle. The following example computes the biorhythms for the 1st of June 1973 for a person born on 27 June 1960.

Example:

Days in 1960, 27 Jun thru 31 Dec	188
Days from 1 Jan 61 thru 31 Dec 72 (365 x 12 plus 3 leap year days)	4,383
Days from 1 Jan 73 thru 1 Jun 73	152
	4,723

Dividing 4,723 by 23, 28 and 33, we arrive at the following:

23 day—173 complete cycles and a remainder of 8

28 day—142 complete cycles and a remainder of 19

33 day—120 complete cycles and a remainder of 4

This means that for the 1st of June 1973 the rhythms are on their 8th, 19th and 4th days of each cycle respectively.

Of course, there's always an easier way to do most things. George Thommen in his book *Is This Your Day?* provides quick reference tables and the instructions for the construction of a simple plotter and scales.

It would serve no real purpose to fill this article with examples in order to prove a point or to support conclusions. The few examples I have shown are in no way conclusive. They are merely representative of biorhythm plots for various situations involving several areas of application. To statistically support the theory, a very large sample relating to various situations would have to be taken. This might well be a job for a computer and a team of experts in biorhythmology.

Now that I have "wet you whistle," I think that you will agree that the biorhythmic theory is interesting. It must be reemphasized, however, that it is a hypothesis and has not been proven conclusively. We all realize there is much more to our physiological makeup than we fully understand. When we acquire this full understanding it may be found that biorhythms are the answer to the questions raised by Hippocrates and others concerning man's ups and downs. Perhaps then there will be a better understanding of man/machine relationships which will enable us to improve our status in this complex era of mechanization.

Correspondence Course Completed

CW2 HENRY CHILDS, a standardization instructor pilot, 1st Squadron, 17th Cavalry, 82d Airborne Division, Fort Bragg, NC, was the first warrant officer in the U.S. Army to complete the Aviation Warrant Officer Intermediate Course by correspondence.

The course, which parallels the six month residence program at the U.S. Army Aviation School, Fort Rucker, AL, allows up to three years to complete by correspondence. CW2 Childs completed the course in slightly more than three months with an academic average of 94.19.

Conducted by Fort Rucker's Department of Army-Wide Training Support, the course covers drug abuse, race relations, computer programing and related military subjects. Designed for aviators, Mr. Childs also studied aviation safety, map reading, flight coordinating, maintenance, and command and staff.

CW2 Henry Childs displays his diploma awarded by Major General William J. Maddox, Jr., Commandant of the U.S. Army Aviation School

The course will soon be designated the advanced course to continue the six month residence course which changed this month (see inside back cover). CW2 Childs and those enrolled in this course will be given credit for completing the advanced course.

Daedalian Foundation Trophy

FOR THE FIRST time a Fort Rucker-based unit received the Daedalian Foundation trophy which was established in 1970. Branch I, Contact Flight Division, Department of Undergraduate Flight Training at the U. S. Army Aviation School, Fort Rucker, Alabama, received the award, which is given annually by the Daedalian Foundation for outstanding achievement in aviation safety and accident prevention. The presentation at Fort Rucker by Lieutenant General Orwin C. Talbott, deputy commanding general, U. S. Army Training and Doctrine Command, Fort Monroe, Virginia.

"What is being recognized in your efforts is the very essence of professionalism," the three-star general stated, noting that the standard of excellence established by Branch I "deserves to be recognized."

According to the award's citation, during the period July 1972 to March 1973 the unit "compiled a most enviable safety record which included in excess of 13,000 accident- and incident-free hours while conducting high-risk training of approximately 500 aviators."

The mission of Branch I is to train pilots in advanced tactical flying operations, low level flight and touchdown autorotations.

Brigadier General Felix L. Vidal (USAF, Retired) of Satellite Beach, Florida, represented the Order of the Daedalians Foundation, a charitable, nonpolitical and nonprofit organization that has as its main activity the promotion of flight safety. The trophy was accepted by Major Jack W. Blien, Branch I commander, at the close of the award period.

The Other Side Of The Coin

William H. Smith
Staff Writer

Army aviation has successfully demonstrated its ability in combat. However, it also has acquired the respect of the civilian community in mercy operations

IT IS POSSIBLE that back in a rear room of some old building one can find reports of rescue operations performed by Army aviation. But, it's not likely that all of them will ever be brought to light. There are simply too many. Some rescues were probably never reported and others are buried so deep in afteraction reports that it would take a major operation to dig them out.

Many of the major rescue efforts are recorded in earlier issues of the U. S. ARMY AVIATION DIGEST. One of the first was reported in the November 1956 DIGEST. The story recalls many missions performed by Army aviation to that time. The article admits however that even at that early date there had already been so many rescues that they would fill a periodical many times the size of the DIGEST.

One interesting mission occurred during Hurricane Diane in 1955. A couple and their children had to be hoisted from the second story of their home. When they were safe the mother, with tears in her eyes, threw her arms around the pilot's neck. "God bless those wonderful, comforting and beautiful little donkeys of the air," she sobbed, "and you Army men, too!" The "donkeys" she referred to were the Army H-25 helicopters used in this mission. The H-25, nick-named *Army Mule*, often had a caricature of a mule on its tail.

The article recaps many other rescue operations that ranged from one end of the nation to the other and even into Central and South America. A lost survey party was rescued; a missionary flown to a hospital; rescues were performed during violent Christmas floods in California; downed aircraft were located and stranded civilians pulled from floods and rivers during disasters.

Army helicopters rescued many in the wake of Hurricane Camille along the Gulf Coast in 1969

Credit is given to the 521st Engineer Company (Topographic Aviation) for its many missions too numerous to list; the 4th Helicopter Company from Ft. Benning is praised for its help in the fight against the Mediterranean fruit fly; and the Army Aviation Group at Ft. Eustis, VA, is credited with 794 missions in which 403,000 pounds of supplies were delivered and 800 civilians rescued during floods in that area.

The one mission that probably did much to bring notice to the Army's rescue efforts was the airliner collison over the Grand Canyon in June 1956. The two aircraft fell into "the hole" at almost inaccessible spots. Under dangerous wind conditions Army helicopters evacuated the victims. This was a tremendous flying feat and it fired the imagination of the American people.

Another mission that gave wide publicity to the Army occurred in Ecuador when a number of missionaries were killed by Auca Indians. Army aviators flew in, found the bodies and buried them. The crewmen returned with identification papers and personal possessions found on the bodies.

During the same period Army aviation supported operations connected with a tidal wave in Hawaii, Hurricane Audrey in Louisiana, a blizzard in Texas and lost individuals in the Rocky Mountains. Army aircraft also assisted in emergency relief during more than 15 floods and 45 forest fires.

In October 1963 the 110th Aviation Company stationed in Verona, Italy, responded to a request for aid from Italian officials in the Belluno area. A tidal wave, caused by the side of a mountain sliding into the lake behind Vaiont Dam, was sweeping south causing havoc in its wake.

The Honorable Silvio O. Conte, congressman from Massachusetts, recorded the 110th's rescue efforts in the Congressional Record of 28 October 1963 by saying, ". . . they transported 180 tons of cargo, laid communications wire by air, carried out more than 300 different missions, carried 4,351 passengers and flew a total of 142 hours or 11,360 nautical miles. . . ."

It is impossible to list in this article the many recorded mercy missions performed in Vietnam. While the enemy considered our helicopters "birds of prey," friendly civilians who were helped by these helicopters thought differently.

One U. S. Army doctor summed up his feelings in the December 1966 issue of the DIGEST stating, "As a soldier here in Vietnam, I marvel at the tremendous military achievements of that wonderful machine we call the helicopter. As a physician I am still further impressed with the role it has played in the preservation of human lives."

"Operation Camille" can be considered Army aviation's best planned and executed mercy mission. Hurricane Camille hit the Gulf Coast region west of Biloxi, MS, on 17 August 1969. It was a highly concentrated hurricane with winds at about 200 miles per hour. It slashed inland and roared northward across Mississippi and into Tennessee before turning eastward across Virginia. Everywhere Camille went was sheer disaster.

The Army organized its rescue efforts on three different fronts. One was centered on the Mississippi Gulf Coast area, the second in Louisiana west of the Mississippi River and the other in Virginia.

The land most affected in Mississippi and Louisiana is very low and mostly flat. It became flooded and the victims fled to the little islands of high ground not covered by water. Roads for the most part were impossible to use.

The air rescue effort was organized similar to a combat mission in Vietnam. Small light observation helicopters scouted the area looking for stranded people. When they were located the helicopters would land and determine their needs. The information was radioed to larger helicopters which brought in supplies or evacuated those who were helpless and in further danger.

One of the more amusing missions also occurred in 1969. In Washington, DC, an unhappy student removed his clothes and crawled up a radio tower. This action interfered with the station's broadcasting. To get him down, the Army used a UH-1 Huey. There is no report of what happened after the pilots got the student on the ground. They probably brought him to a clothing store.

Army aviation displayed its versatility once again in a daring rescue mission in Alaska. In June 1970 a mountain climber became sick and was stranded at the 15,000-foot level of Mt. McKinley. Twice the

helicopters tried to rescue him but were rebuffed by bad weather. On the third try they made the rescue but it took a total of 27 sorties and 24.3 air hours.

In November 1970 tidal waves and torrential rains hit the islands and coastline of Pakistan. Hundreds of thousands of people were killed. Immediate action was imperative to prevent additional thousands from dying of starvation, exposure, cholera and typhoid epidemics. A contingent of the 182d Aviation Company (Assault Helicopter) flew into the stricken area. Within an hour and 15 minutes of their arrival in Dacca, the unit had a helicopter mission ready.

Delivery of food supplies was of primary importance. Everywhere Army aviators flew huge crowds gathered to collect food. By the end of the rescue effort 1,111,295 pounds of blankets, food, medical supplies and clothing had been delivered and more than 17,300 passengers airlifted.

In August 1969 the Secretary of Defense, acting on a suggestion, recommended that military aircraft be used to help civilians in highway accidents and other emergencies. From his recommendation came the Military Assistance to Safety and Traffic (MAST) program. Five sites were selected to test the concept, two of these were Air Force bases and three were Army posts (one Air Force base was deactivated on 31 March 1973).

The MAST test program was an outstanding success. By October 1973 the military crews had logged 4,740.7 hours, flown 2,329 missions and handled 2,646 patients.

In November 1973 Congress passed the MAST program as an amendment to the Military Procurement Authorization Bill for fiscal year 1974, and the President signed the bill shortly thereafter. The program is designed to bring help to those in need when helicopters are the most expeditious transportation. When another mode is judged better, it will be used. The MAST program should save thousands of lives in the coming years.

Malaysian floods (above) in 1971 brought Army helicopters from tactical commitments in the Republic of Vietnam to perform their mercy missions. Army helicopters (below) were vital in recovery operations after the 1956 Grand Canyon airline catastrophe

VIEWS FROM READERS

Sir:

A writer I'm not, an aviator I am, and I would like to comment on the October 1973 issue.

First, USAASO—Bravo on Pilot-age. We have been teaching instruments to all the noninstrument rated aviators with so much emphasis that it is surprising how many cannot dead reckon anymore. In my experience, small staff transport units and attached aviators are having the most trouble. Too much IFR fixed wing time, I guess.

Second, and most important, "Army Aviation Needs Job Enrichment." A well-written article, but the major has been in the wrong units. All the Army units to which I have been assigned have had a permanent crewchief on each aircraft. The crewchief's permanence, however, was dependent upon his degree of performance. The challenge and motivation rests in the fact that there are several junior EM standing in the wings, confident in their belief that they can do the crewchief's job better and just waiting for a chance to prove it.

Army aviation provides *every* aviator with an opportunity for achievement, responsibility and recognition by virtue of his job. This does not require comment. Ask any aviator to explain it to you, if you aren't one.

He has already stated the hygiene motivations are provided by the centralized aviation unit. So, why change the system? Let me put an argument against it.

• Instructor pilots are hard to come by.

• Safety officers give the close look, even if the commander only has time to give it lip service. Good safety officers are available if commanders will take their advice to heart and follow it.

• Leadership—the 60 aviators in a unit are not all leaders; the majority are warrant officers who have a primary job of flying aircraft and, hopefully, they will all have meaningful secondary jobs within their platoon or section. Commissioned officers have the responsibility of being leaders and keeping these aviators oriented to the basic mission of the ground commander by periodic tours in this capacity.

Any article is subject to oversimplification due to space available and so must this answer. The commander of the small unit who takes command after being tied to a desk for any amount of time, with no instructor pilots, instrument examiners or safety officers, knows the problem. Aviators are not trying to protect an empire, we are trying to give the ground commander the most blade time, with the least ground time on each machine in the inventory, flown by a smart, safe, professional pilot who knows his machine and has an understanding and basic knowledge and appreciation of the soldier and his mission. I hope we have done this in the past and continue to do it in the future.

(Please sign this—
"One each aviator.")

Sir:

Reference TM 55-1520-210-20, change 2, page 7-38, paragraph 26b.

Reference above concerns the inspection of tail rotor drive shafts for loss or partial detachment of balance strips which are bonded to the near center of the shaft.

What are the correct procedures utilized upon discovery of an absence of an ARADMAC stamp where a balance strip is missing? We have an aircraft that has one weight missing and it does not have an inspection stamp marking. The area is one (1) inch long and appears to have been the balance strip that was removed to check for bonding separation but has no stamp located on the area itself nor at either end of the drive shaft in-line with the balance strips.

We are aware of the note that indicates that an empty imprint does not necessarily mean a balance strip is missing and that it is a result of the removal of a test coupon. However, it also states that the last in-line balance strip should have a vibro-etched notation stating that it was balanced at ARADMAC.

We would therefore like your professional assistance in determining if a

ATTENTION MODB (Military Occupational Data Bank) project officers and enlisted men with the following MOS: 67 Aircraft Maintenance, 68 Aircraft Components Repair, 93D Flight Simulator Specialist, 93H ATC Tower Operator, 93J ATC Ground Control Approach Specialist, 93K ATC Approach Control En Route Specialist, and 93L Air Traffic Control Chief. The above enlisted MOS will be surveyed and the Military Occupational Data Bank Questionnaires will be in the mail shortly. For more information see February 1974 edition of the AVIATION DIGEST

tail rotor drive shaft is still good if only one weight is missing, there is no high frequency vibration, and there is no ARADMAC marking on the last balance strip.

SP6 Robert W. Piatt
HQ, 32d Signal Battalion (Corps)
APO New York 09757

• The DIGEST received the following answer from the U. S. Army Aviation Systems Command, St. Louis, Missouri: The Utility Helicopter Branch of Systems Engineering advises that "The note on page 7-38, paragraph 26b of TM 55-1520-210-20 states that if more than one weight is missing, inspect the drive shaft for in-line ARADMAC notations. Since only one weight is missing, the drive shaft is acceptable and the ARADMAC notation is not applicable in this case."

Sir:

With the Vietnam conflict already history, Army aviators are saying that the *real* flying is over. Not so! For that young lieutenant or warrant who thinks he is destined for a life of copilot duties, it need not be that way. Army aviation has a responsibility to develop the proficiency and technical ability of *all* Army aviators. One way that this can be accomplished is by flight platoon leaders and aviation commanders initiating a program similar to the one the Fourth ROTC Region Aviation Division has adopted.

First, a little background on the newly organized Fourth Region. It is commanded by Brigadier General Sinclair L. Melner who, while not an Army aviator, is a strong supporter of Army aviation through the ROTC Flight Instruction Program (FIP) in his Senior ROTC schools. The FIP selects worthy cadets who receive 36½ hours of flight instruction at an FAA approved civilian flight school. The objective of the ROTC program is to screen cadets for future Army flight training.

To support the Fourth Region Headquarters, which encompasses a 15-state area, the command was given an Aviation Division that will fly the commander and his primary staff to the schools within the Region. This aviation service is to be provided by utilizing the "TDA Authorized" U-21 aircraft.

Well, that's enough background on who we are and what we're doing. The real innovation is how our aviators are accomplishing their mission while furthering Army aviation. The Aviation Division does not have any "ole guy" aviators; everyone from the division chief on down takes his turn at flying as copilot (that's a right seat for utility fixed wing). This concept is nothing new. My first exposure to a program like this was with the Command Aircraft Company (CAC) on my second tour in RVN 1972 to 1973. The real secret to this program is command emphasis from all levels to ensure that the exposure and experience is gained by *all* aviators by flying their "fair share" as *pilot in command.*

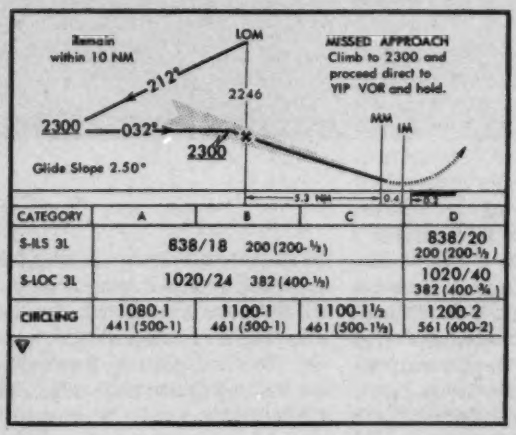
The Fourth Region aviators are making the system work while flying an estimated 800 hours yearly. Army aviation is continually at work even while on the ground. The Fourth Region aviators will be talking to prospective aviators on the campus and will be providing a "survey service" of FAA flight contractors for the FIP.

In closing, we of the Fourth Region invite everyone to participate in the "Army Aviation Equal Opportunity" program. Have a "Happy Holiday" and *KEEP FLYING ARMY.*

CPT Thomas J. Sinclair
Chief, Aviation Division
HQ, Fourth ROTC Region
Ft. Lewis, WA 98433

INSTRUMENT CORNER

The new December 1973 AR 95-1, paragraph 4-23b, provides the criteria for determining the need for an alternate airfield based on forecast destination weather. For example, if the published weather minima for a straight-in ILS runway 3L approach (categories A and B) is 200 feet ceiling and 1/2 mile visibility (see chart inset), the method of computation for each category is:



CATEGORY	A	B	C	D
S-ILS 3L	838/18 200 (200-½)			838/20 200 (200-½)
S-LOC 3L	1020/24 382 (400-½)			1020/40 382 (400-¾)
CIRCLING	1080-1 441 (500-1)	1100-1 461 (500-1)	1100-1½ 461 (500-1½)	1200-2 561 (600-2)

Airplane

1. **Add 400 feet to the published ceiling (200′ + 400′ = 600′).**
2. **Add 1½ miles to the required visibility (½ + 1½ = 2).**

NOTE: If the forecast weather is less than 600–2, an alternate is required.

Helicopter

1. **Add 400 feet to the published ceiling (200′ + 400′ = 600′).**
2. **Reduce the published visibility (½) by 50% to obtain the required visibility (¼), IAW paragraph 4-26d, AR 95-1 (½ reduced by 50% = ¼).**
3. **Add 1½ miles to the required visibility as derived in step 2 (1½ + ¼ = 1¾).**

NOTE: If the forecast weather is less than 600–1¾, an alternate is required.

ICING...

Experiments in Alaska help determine how helicopters react in freezing rain

Specialist 4 Larry Scaramella

THE U. S. ARMY Aviation Systems Command (AVSCOM) has conducted an inflight icing test experiment in an attempt to find the capability of their helicopters to operate safely under selected icing conditions.

The testing was conducted at Ft. Wainwright, AK, by a team of 20 pilots, engineers, instrumentation specialists and maintenance personnel from the U. S. Army Aviation Systems Test Activity (ASTA), Edwards Air Force Base, CA.

The schedule called for tests to be conducted on four of the Army's firstline helicopters, but according to Lieutenant Colonel Warren E. Griffith III, a project officer, the tests were completed on only two helicopters—the UH-1H Huey and AH-1G HueyCobra—due to problems encountered with weather, instruments and the ice spray system.

The scope of the tests was outlined by Major Robert K. Merrill, project pilot from ASTA. He said that what they were doing was looking for changes in the performance and handling qualities of the aircraft under artificial icing conditions and comparing the results against a natural icing situation.

This was the first time that any icing experiments have been conducted by the Army on aircraft to any great extent. However, Major Merrill pointed out that the Air Force has done some artificial ice testing with similar aircraft and Great Britian has experimented with natural icing.

Three aircraft were used during the Army tests. First, a CH-47C Chinook was specially equipped with a 1,800-gallon water tank and spraying system to spume water at selected altitudes conducive to the desired freezing temperatures. This creates a simulated effect of natural icing. Ice formed over the test aircraft as it was flown behind and under the Chinook. The test aircraft was equipped with a six channel oscillograph to measure vibrations. Tape recordings also were made of the pilot's comments throughout the flight. In addition, an icing probe was included in the test aircraft's gear. The probe could be seen by the pilot during icing accretion and used to measure local ice buildup. It consisted of a knife edge with a color-ringed needle attached and pointing forward. As ice built up on the knife edge, color rings on the needle were covered with ice proportionately and icing

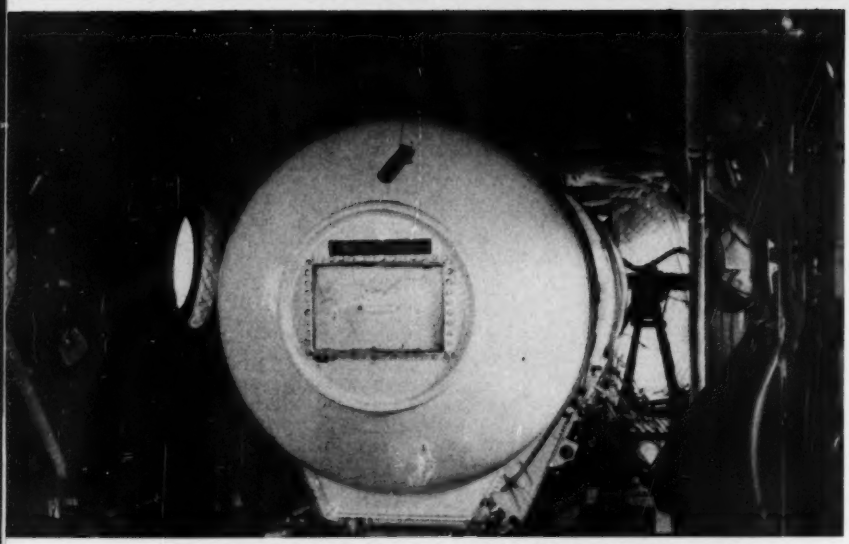
accretion measured. An ice detector also was used on the test aircraft to measure the ice accretion and to monitor the accumulation rate.

A chase, or third aircraft, followed the test helicopter and with a high speed motion picture camera recorded the performance or handling qualities of the test aircraft to determine changes from normal flight.

When a limiting factor was reached the test was discontinued for that aircraft. According to LTC Griffith the testing on the Huey has been completed. He said they were very pleased with the experiments and that they were meaningful and should have some impact on flying under icing situations in the future. Also, he said that the final results of the experiments will be published in a report by ASTA.

The capability of Army heli-

A UH-1 Huey (above left) gets a cold shower of water during an icing test. When water hits the test aircraft, a buildup of ice occurs. An electronics technician (above) installs camera for recording icing tests



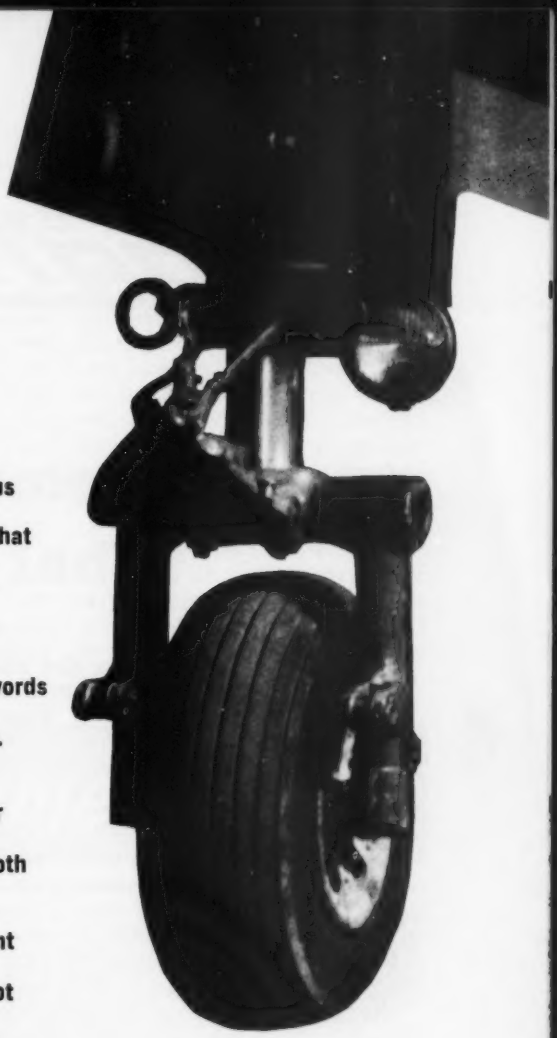
A 1,800-gallon water tank (above) in the CH-47 Chinook provides the water supply for the icing tests. Flight crews (below) are briefed on the operation

copters to operate under instrument flight rules, including the capability of helicopters to fly safely in icing conditions, is one of the reasons increased emphasis has been placed on the tests. The experiments may also determine what if any problems must be resolved before the release of a helicopter for flight into icing conditions. Finally, the tests may provide data which can be used to determine what flight restrictions should be imposed on the aircraft when it is released for operational use in icing environments.

The question of the aviators' safety was brought up during the tests. MAJ Merrill explained that the tests were not dangerous because of the method in which they were conducted. He said they went slow and knew what was going to happen—that's why they used slow ice buildup techniques.

The Aviation Systems Command selected Ft. Wainwright because of the availability of Army facilities and support plus the availability of required test weather and temperatures during the early fall.

When Landing Is Assured



CW2 Thomas M. Willett

I GUESS AS LONG as we have retractable gear aircraft in the world Murphy's Law will take its toll. Since numerous gear up accidents occur during single engine training in multiengine airplanes, I would like to discuss a technique that can remove the guesswork out of the old familiar phrase "when landing is assured" found in most Army single engine dash 10 checklists.

Since quite a bit of confusion seems to exist, the following single engine operational technique of multiengine airplanes is being brought to light in order to help define the words "when landing is assured," and to generate discussion within the Army aviation community on the subject.

It has long been my contention that there is no reason to wait until short final to lower the gear during single engine operation. This technique depends on two other procedures which coincide with the lowering of the gear. First, the pilot must practice his normal traffic pattern (with both engines running) in such a way that after his initial power reduction his aircraft will descend to and touch down on his desired touchdown point on the runway without subsequent addition of power. He would have to use a large initial power reduction with respect to METO (maximum except takeoff) in order to establish this desired glide angle. If at all possible this reduced power setting should be as close to zero thrust as standardization or engine limitations will allow. When this is done a pilot would just about be telling himself that he could feather both engines at that point and still have the runway made.

Second, the pilot should practice the technique of always checking the gear indicators down or green prior to initial reduction of power for landing. Since green is universally a signal to proceed, this would be his signal to commence the visual approach.

When these two procedures are used for the single engine pattern, the same point (in time) can be used as in the normal pattern, i.e., the point when the pilot feels the need to slow down or descend from the altitude he is holding in order to touch down on a desired spot. An added benefit to this procedure is that he would not have to interrupt a "before landing check," which has proved to be disastrous for some in the past.

With all this in mind "landing is assured" when a pilot begins his descent for landing and not on short final when he is too busy and can easily overlook checking the gear down.

Flying Thru

The Only Way To Grow

Remember What You Learned

...is the best advice, when encountering unusual situations... previous training and experience can be an asset

CW2 Charles M. Tidey

THE MISSION that night was to be the same as it had been all week. We were to fly our three infrared-equipped AH-1G Huey-Cobras to the firing range for static firing of the turret weapons.

The weather for the first part of the evening was forecast to be good. But a front moving in from the west was expected to arrive shortly before dawn. So with the thought of getting off before the usual "sun up" release time, we proceeded to the aircraft.

After the preflight we took off in a flight of three. Upon arrival at the range we shut down and congregated around the armored personnel carrier (APC) that served as our test headquarters. There we received the mission briefing from the officer in charge (OIC)—a rated major from the testing agency.

Looking out toward the west later that night we occasionally saw lightning along the approaching storm front. At about 0300 hours the storm appeared to be passing our immediate area to the north. The test OIC decided to release two of the Cobras immediately and the third as soon as it finished firing the ammo it already had loaded. It was estimated that this would take about 15 minutes.

With the prospect of getting home earlier than expected, my partner and I quickly got out to our aircraft and proceeded with the runup. When we had the aircraft up to operating rpm with all systems operational, we looked around to see the crewmen of our wingship just arriving at their helicopter. The aircraft on the firing pad looked like it had another jam of its weapons systems.

Looking back toward our wingman we saw a few sprinkles on the canopy and noticed that he was just untying his main rotor blades. *Then it hit!*

The storm seemed to blow in from nowhere and the violent wind was trying to push our Cobra's tail to the left. I quickly glanced at our wingman and noticed that he was tying his blade back down. He began running for the APC then suddenly he and his crew disappeared into the darkness that seemed to swallow us up.

My backseat (with whom I usually flew and who had more than 1,900 hours IP time in the Cobra) and I (with more than 2,200 hours total time) quickly decided to try to pedal turn into the wind. We turned on our searchlight and located a nearby rock to use as a reference point during the turn.

With the aircraft finally facing into the wind, we kept the searchlight on the rock so that we could tell if the wind was pushing us backwards or sidewards. Now we started discussing what we were going to do when the storm finally let up. We decided that due to the severity of the winds, which were slamming rain and sometimes small hail into our aircraft, we would shut the aircraft down and pull a thor-

ough postflight before deciding whether to fly it on home or not. During this time we were indicating steady winds at 75 knots on the air speed indicator.

As the first squall line passed over us and the storm let up for a few minutes, we quickly shut the aircraft down, secured the blade and headed as fast as we could in the darkness for the personnel carrier that by this time housed all the other people from the test site.

Upon reaching the APC we found there was no room for us inside so we stood on the downwind side of the vehicle and weathered out the rest of the storm. During one of the numerous flashes of lightning I saw the forward blade of our Cobra flex way down and the thought occurred to me how lucky we were to be out of the aircraft and on the ground.

After the storm was over we found out what had happened to the crew of the aircraft that had been on the firing pad. During these static fire tests an auxiliary power unit (APU) had been parked next to the aircraft to facilitate the many starts that are required for this testing. When the wind first hit it had pushed the Cobra's tailboom into the APU. Simultaneously the stinging rain began hitting the ground personnel who were around the aircraft. They quickly dearmed the weapons systems and took off for the security of the APC. When the pilots in the cockpit felt the aircraft strike something and then saw the ground personnel running away, they quickly shut the aircraft down and departed the immediate area.

Though the storm now had passed we decided that an adequate postflight was not possible in the darkness, so we all departed in a truck after we filled out our DA Form 2408-13s noting any obvious damage and also stating the severe weather conditions to which the aircraft had been subjected.

Looking back I feel there are many lessons to be learned from this experience. The one that stands out foremost in my mind is that we didn't panic; we just quickly evaluated our situation and selected a course of action. The crew coordination was excellent throughout and I feel this was one of the main reasons we made the right decisions at the right time, which resulted in no damage to our aircraft.

My suggestion to anyone else encountering unusual situations that require quick, positive reactions is to remember what you've learned in all your previous training and experience . . . and keep cool; you'll do the right thing.

worth remembering

PEGGY MEHAFFEY and Specialist 4 James D. Trauger help give rebirth to Building 70210 at Ft. Huachuca, AZ. The activity is part of the worldwide Army Communications Command's air traffic control (ATC) office. The ATC mission was assigned to the command here on 1 July 1973 by the Army office of the assistant chief of staff for communications-electronics.

SUPERVISION—

Arnold R. Lambert
Directorate for Education and Prevention

USAAAVS

-THE KEY TO ACCIDENT PREVENTION

THERE ARE MANY ways to refer to the top man in an organization. He can be called Chief, Director, Honcho, Boss or Commander, and some are often referred to in other ways that are not very complimentary. But regardless of how he is referred to, the top man is only a man and needs help if he is to accomplish his mission.

Whether he is building a skyscraper, manufacturing rubber baby buggy bumpers or commanding an army in defense of his country or the freedom of an ally, dependable subordinates are essential to the top man. Supervisory personnel are tasked with the responsibility of accomplishing a portion of the organization's overall mission and reporting to the top man. Their degree of dependability will determine the success of the organization.

Destruction of materials and equipment or injuries to personnel can delay or prevent an organization from accomplishing its mission. Therefore, accident prevention is one of the most important responsibilities of every individual (supervisory or otherwise) and must be a matter of concern from top to bottom in the chain of command.

In Army aviation, AR 95-5 and DA Pamphlet 385-1 clearly establish accident prevention as a personal responsibility of the commander. The commander is empowered to assign certain responsibility to his staff and supervisory personnel within his command. In addition to safety responsibilities assigned to supervisory personnel, a full-time position of aviation safety officer must be established. The safety officer is directly responsible to the commander on all matters pertaining to accident prevention and to be effective he must have direct access to the commander at all times.

Although the commander depends upon his safety officer and supervisors for identifying accident potentials and administering the accident prevention program, he can never delegate his command responsibilities for the prevention of accidents. Therefore, if subordinates fail in their accident prevention duties and an accident occurs, the commander fails also.

Here is an account of an accident in which command supervision failed in several areas.

At 0830 hours, the instructor pilot and pilot arrived at operations and filed a DD Form 175 and 175-1 Flight Plan and Flight Weather Briefing. The mission was an authorized 14-day TDY trip. The 175 Flight Plan was an IFR, 6-hour, nonstop route to destination. The IFR clearance request called for a 1000 local takeoff time. At approximately 0915, the flight crew arrived at the airplane. Part of the baggage and cargo was loaded on the day prior to the scheduled flight. A preflight inspection was conducted and the remaining cargo and passenger baggage was loaded. The three crewmen and 11 passengers boarded the aircraft at approximately 0950 and at 0955 the engines were started.

The IP called the tower for taxi instructions at 1000. The ground controller cleared the aircraft to the runup area and reminded the crew that the existing weather was 100 feet overcast, ⅛-mile visibility and fog. The aircraft was taxied to the runup area and an IFR clearance was issued for the flight. Radar release instructions were issued and at 1017, the aircraft was cleared for takeoff.

At 1018, the aircraft broke ground and radio contact was established with departure control. Radar contact was confirmed and the crew was instructed to turn left to 050 degrees and report leaving 4,000 feet. At 1019, the aircraft was vectored to a heading of 320 degrees. Both of these radar vector instructions were acknowledged by an aircraft crewman. At 1023, the aircraft was cleared direct with an altitude restric-

tion of 7,000 feet. This was the last departure instruction acknowledged. At 1026, departure control instructed the crew to recycle the transponder because the signal had been lost. There was no reply to this request. The aircraft was seen by radar to continue on a northwest course. Numerous calls on UHF, VHF and guard channels failed to obtain response. At approximately 1043, the aircraft was seen on radar skin paint, entering a right turn. Seconds later, radar contact was lost. At 1045, the aircraft disintegrated in the air, spilling passengers and cargo from the fuselage. The tail stabilizers and control surfaces, part of the right wing, the left wing and the left engine broke off in flight, creating a debris pattern of over one-half mile. All 14 people on board were killed instantly upon impact with the ground.

It didn't take long to learn that the aircraft had begun breaking up in flight. One witness reported seeing the aircraft just prior to impact and said that one wing was missing.

Every shred of evidence was investigated and witnesses were interviewed to determine the cause of this disaster and perhaps prevent similar happenings in the future. The step-by-step procedures used in examining the wreckage, interviewing witnesses and studying historical records of the aircraft produced evidence that the *lack* of adequate command supervision involved several areas of responsibility and is considered to have definitely contributed to this accident.

The first indications of a problem relating to the crash began more than THREE YEARS prior to the accident. The history of changes in structure or equipment was not entered on Weight and Balance Form 365C. Steel alclad flooring, upholstering and seats (totaling 1,385 pounds) were located in the wreckage. These items had been installed in the aircraft but not recorded in the weight and balance file. The lack of these entries on the weight and balance forms and the very low basic weight noted at the last weighing of the aircraft (nearly 2½ years prior to the accident) make it apparent that this additional equipment was not included. The weight and center of gravity (CG) as entered on DD Form 365C was incorrect. Consequently, the crewmen were flying a heavier aircraft with a greater aft CG than they realized.

Since this was the beginning of a 14-day TDY trip, extra baggage was loaded on board. The majority of the baggage and cargo was stored in F and G compartments, placing the aircraft in an "out of limits" CG of 8 percent mean aerodynamic chord (MAC) (as later computed) to the rear. Cargo weighing 1,806 pounds was stored in compartment G, an area with a structural design for 1,300 pounds. Since the crew did not complete or file a DD Form 365F (Weight and Balance Clearance), they could not have been aware of the total weight or CG. This extreme aft CG made the aircraft very unstable, subject to entering spins and susceptible to structural failures.

Between five and eight minutes after takeoff, UHF and VHF radio communications were lost between the ground controllers and the aircraft. In addition, the APX 44 transponder signal was lost. No calls on UHF, VHF, VOR or guard channels were acknowledged by the crew from this point to the crash site. An analysis of the UHF, VHF, VOR and transponder aircraft control heads revealed that the crew did not change their communications frequencies or transponder setting from the initial departure control instructions issued by the tower. This led to the conclusion that the aircraft had lost both its UHF and VHF receiving and transmitting capabilities. The loss of the transponder signal suggests a loss of 28-volt electrical power to these radios. This evidence does not necessarily indicate a loss of 110-volt power to the flight instruments or a complete loss of electrical power, since the crew was able to feather the number one propeller later in the flight. One inverter was operating upon impact.

It was impossible to establish the exact sequence of events during the in-flight breakup. However, a study of various modes of failures of the parts that separated, plus the debris pattern on the ground, leads to the following most probable sequence: The number one engine lost power and was feathered. The aircraft was seen by radar skin paint entering a right turn and then disappeared from the screen. It is apparent the crew was unable to maintain control of the aircraft because of the extreme aft loading of cargo. The aircraft stalled due to a loss of airspeed, rolled violently to the left and entered a severe nose-down attitude. An attempt to pull out of this dive resulted in the negative failure of the elevators and horizontal stabilizers. This loss of control surfaces led to a tail-over-nose tumble. As the aircraft reached a vertical nose-down attitude, the left wing tip failed in negative loading. As the aircraft continued to rotate, the right wing section twisted off in torsional loading. When the aircraft reached an almost level attitude, the left engine was thrown from the center section at an angle from the aircraft flight path. The left wing subsequently separated and the remainder of the aircraft crashed on a flight path heading of 254 degrees.

At some point in the breakup, the fuselage main cabin area opened up, resulting in passengers and cargo being thrown from the aircraft prior to impact.

The number one engine propeller was feathered by the crew in flight, shutting down the engine. This engine and propeller assembly was airshipped to ARADMAC, Corpus Christi, TX, for teardown analysis. The analysis did not reveal any failure or malfunction of the propeller, engine or engine accessories that would have instigated the feathering of the propeller. Consequently, it was impossible to determine why the crew shut down the number one engine.

The ARADMAC teardown analysis of the UHF, VHF, VOR radios, transponder, generators and inverters did not reveal any malfunctions. The generators were in functioning condition and one inverter was operating upon impact. The inverter supplies 100-volt electrical power to the flight instruments and the generators 28-volt power to the radios. No determination could be made as to what caused the loss of radio communication and there was no evidence that indicated this loss of communication contributed to the cause of the accident.

The pilot was not rated in the airplane and had only 86.6 hours, of which 66.8 hours were as copilot. He had not flown in the aircraft for 40 days prior to the accident. He had very little (3 hours) instrument training as first pilot in this aircraft. He had never received demonstrations of single-engine procedures or stall characteristics of the aircraft. This lack of training, coupled with the fact that he was flying on instruments when the left engine lost power, compounded aircraft control problems. This could easily reduce the very marginal performance envelope that this aircraft had before becoming completely uncontrollable.

The IP's artificial horizon instrument was carried on the 2408-14 as inoperative for approximately 6 months. Considering the weather conditions at the time, the crew was flying on instruments. The inoperative instrument would place an additional burden on the IP should he find it necessary to take control of the aircraft. This condition may have added to the confusion just prior to the loss of aircraft control.

The emergency situation, i.e., the loss of power from the number one engine, and the subsequent loss of aircraft control must have developed in a very short time frame. Before takeoff, each passenger was instructed to remove a parachute from compartment G and place it under his seat. These parachutes were located in the wreckage. Not one chute showed signs of the harness being readied for use. Each parachute was found with all straps and harnesses fastened and secured, not unlike a chute issued from a repack facility. It was concluded that some of the passengers would have attempted to chute up at the first signs of an emergency, had time permitted.

No higher headquarters was directly monitoring and evaluating this unit's methodology in the accomplishment of routine daily tasks. Tasks, such as maintenance procedures, weight and balance computations, crew selection, preflight requirements and aviator proficiency, show a definite lack of effective local supervision and are indicative of the results of no upper echelon supervision. The fact that supervision of all operations begins and ends at detachment level manifests itself in the form of numerous administrative errors and omissions on maintenance records. Examples of these are: the inaccurate computation of weight and balance data; not filing a valid 365F for this particular mission; allowing a pilot who was not rated in the aircraft to fly a mission of this nature under the weather conditions existing at that time, after having not flown the aircraft in 40 days.

Evidence yielded the following facts:

• Erroneous weight and balance data, coupled with inadequate preflight computation of passenger and cargo distribution, placed the aircraft in an extreme aft, unbalanced condition, resulting in a center of gravity of approximately 36.1 percent MAC, or 8 percent MAC aft of the design limit.

• Loss of power from the number one engine aggravated the unstable balance condition of the aircraft and contributed to the loss of control.

• Transition training was combined with a mission transporting passengers and cargo in instrument meteorological conditions using a pilot with limited instrument and emergency training in the aircraft.

• The absence of high echelon, aviation-oriented supervision in the unit's chain of command definitely contributed to the administrative and managerial deficiencies found during the course of this investigation.

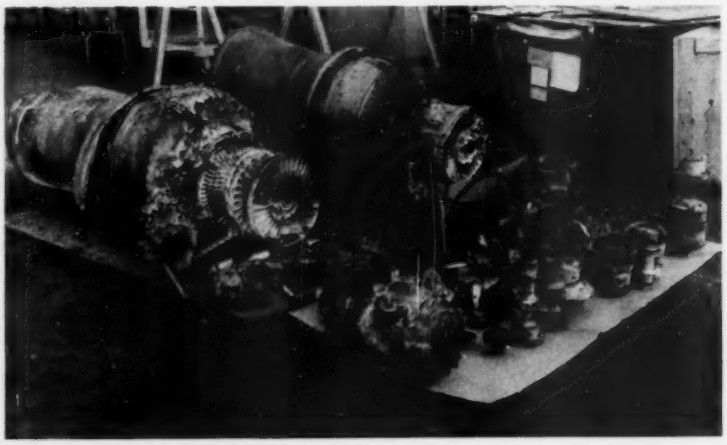
A commander may think his supervisory staff is doing a fine job, but all too often it takes an accident to open his eyes. After an accident, he may find his staff has been permitting unauthorized shortcuts, records are not being maintained, maintenance is not being performed by-the-book, SOPs are not being followed and many other shortcomings exist. This is when he faces the realization that he has failed; because accident prevention is his personal responsibility.

teardown analysis for the accident investigator

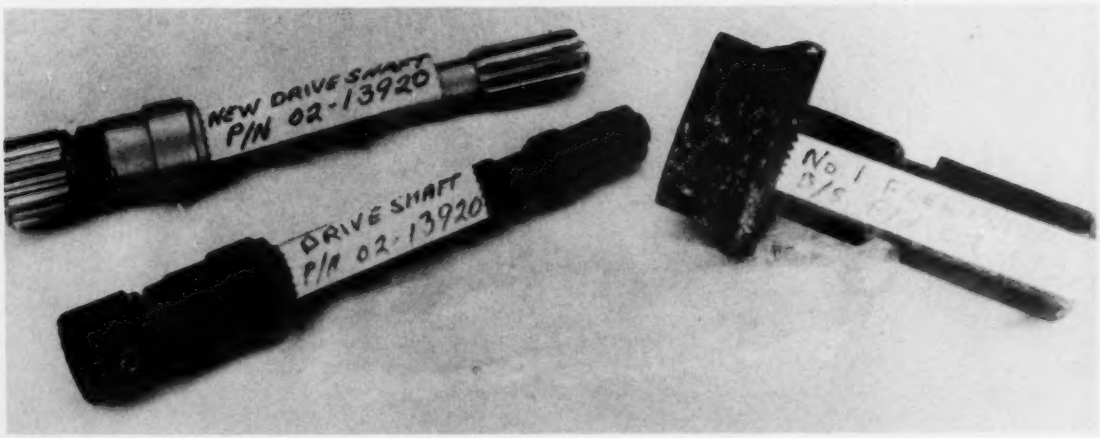
CW3 Walter E. Jones

THE RESPONSIBILITY for determining the causes of aircraft accidents rests squarely with the members of the investigation board. But board-members sometimes are unable to determine specific causes, and are mystified by the type of failures they come across. When this happens, materiel should be submitted to the Army Aeronautical Depot Maintenance Center (ARADMAC) for teardown and analysis. Materiel exhibits may be the entire aircraft, major components, subassemblies, separate components or parts which are suspected to have contributed to the accident. Exhibits are submitted in accordance with the procedures outlined in paragraph 11-5, AR 95-5; and Supply Letter 24-73, dated 31 May 1973. CH-54A and B airframe components and parts will be evaluated by Sikorsky Division, and JFTD 12A-1, T73-P-1 and T73-P-700 engines or parts will be evaluated by Pratt and Whitney Division, United Aircraft Corporation. These exhibits are often the key items in determining the exact cause of an accident.

The manner in which these exhibits are handled and sent in for teardown analysis will reflect directly on the quality and completeness of the final report



A CH-47A crashed with all on board killed. A teardown analysis investigation on these two T55-L-7B engines revealed the fuel control drive shaft on one engine was stripped out at the splines (below). This condition caused the engine to flame out and ultimately cause the crash. The board findings would have been unknown if they had failed to send these exhibits in for teardown analysis



from ARADMAC. As aircraft investigators, it is necessary for each of us to know the proper procedures for gathering these exhibits, preparing them for shipment, inclosing all the information needed by ARADMAC and shipping them by the most expedient means. When the proper procedures are followed, ARADMAC will be able to do a complete and thorough teardown analysis on the exhibits. In return, you will receive a complete and comprehensive report which may contain the specific cause of the accident.

Gathering Exhibits for Teardown Analysis

The Materiel Analysis Branch of ARADMAC has the mission of determining the cause of failure or malfunction of crash-damaged exhibits from rotary and fixed wing aircraft, powerplants (reciprocating and turbine engines), associated components and assemblies, and related systems received from aircraft accident investigation boards in the field. Exhibits for teardown analysis may consist of complete airframes, engines, transmissions, gearboxes, pumps, servos, bearings or separate failures such as fractured bolts or fracture surfaces from aircraft components. Reasons for failure or malfunction may include any one or a combination of variable factors—maintenance error, other personnel error (fueling, weapons loading, etc.), lack of maintenance discipline, improper installation or adjustment, materiel maifunction, functional or design error, faulty overhaul and fabrication, or other errors with unknown causes.

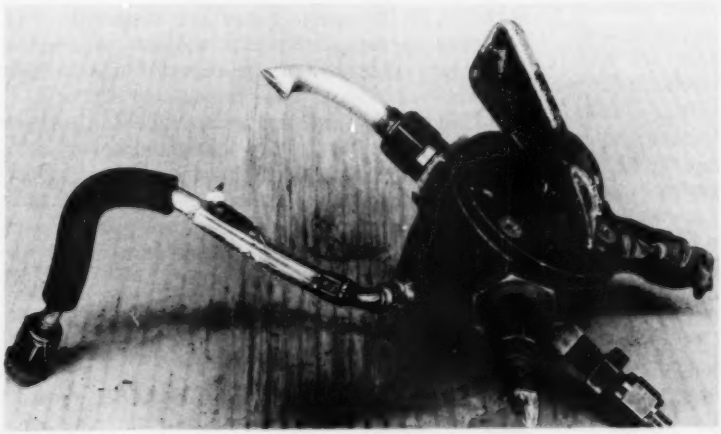
The president of the aircraft accident investigation board, or the maintenance officer (if applicable), will select aircraft components or parts for teardown analysis which are suspected of contributing to accidents, incidents, and forced or precautionary landings. Selection of exhibits is based upon findings of the investigation or upon individual requirements for analysis. After the exhibits have been selected, CONUS units request concurrence for the proposed selection and a control log number from the Commander, USAAAVS, Fort Rucker, Alabama. Overseas units obtain concurrence from the theater commander. This concurrence and control log number may be obtained verbally or by message.

Preparing Exhibits for Shipment

Steps must be taken to safeguard exhibits to preclude any disassembly that may affect or hinder an effective teardown analysis. If disassembly or partial disassembly is necessary prior to shipment, complete documentation and photographs should be made of the disassembly. Disassembly should be made only by qualified personnel, and with members of the accident investigation board present.

Photographs should be taken of all exhibits before any cleaning or decontamination. Cleaning should be done only to the degree necessary for shipment. Exhibits should be cleaned to remove all traces of foreign matter such as vegetation, human or animal tissues, insects, dirt or contaminated water. The exhibits should not be cleaned to a point that distorts or removes possible evidence such as heat discoloration, signs of abrasion, stress and torsion splinters, or corrosion. All exhibits should be decontaminated to prevent any possibility of generating health hazards or crop infestation. All lines and openings should be capped off or covered and sealed. If needed, exhibits should be preserved in accordance with applicable technical manuals. Preservation should be made only for the time needed for shipping.

If possible, the exhibit should be shipped in the shipping container made for it, such as an engine can or transmission can. If a proper container is not available, packaging should be accomplished by the



Exhibits for teardown analysis are received from all aircraft in the Army inventory. This fuel selector valve from an O-1A was sent in to determine the exact position of the valve. Note that all lines and openings are capped off to prevent contaminants from entering the valve

This Martin-Baker MK-J5B ejection seat from an OV-1B was improperly packaged and shipped for teardown analysis. The wooden box it was shipped in was not waterproof, and no packing material was provided to separate and prevent components from shifting during shipment. Improper packaging of exhibits can cause additional damage during shipment and hinder the specialist in performing a complete and comprehensive investigation

nearest support activity having a packing, crating and shipping capability. Exhibits should be packaged carefully, under the supervision of the accident investigation board, to prevent further damage, distortion of physical evidence (fractured areas) or alteration of components or parts. Fracture surfaces should never be mated, or come in contact with any item during packaging or shipping. If necessary, exhibits should be blocked in the container to prevent movement during shipment. If more than one exhibit is shipped in the same container, careful blocking is required to prevent further damage from exhibits making contact with each other. After blocking, measures should be taken to absorb any moisture inside the container. The shipping container should then be sealed to prevent any moisture from entering the container during shipping.

Samples, Documents and Information Needed by ARADMAC

In performing a complete and comprehensive teardown analysis, ARADMAC needs all the information available pertaining to the exhibit. The following samples and/or evidence should be shipped with the exhibit:

- Any fluid samples pertinent to the exhibit taken at the accident site. These may include fuel, oil, hydraulic fluid and/or lubricant samples.
- Water and/or soil samples. If the exhibit has been submerged in water or buried in the ground, these samples may assist in the analysis.
- Metal particles found on the chip detector plugs and/or filters.
- Foreign matter (rags, shop towels, rocks, tools, etc.) suspected of causing foreign object damage.
- Any foreign items which may be pertinent to the teardown analysis of the exhibit (i.e., a tree branch which the rotor or prop may have struck).

The following documents and information should be mailed directly to ARADMAC at the time the exhibits are shipped:

- Maintenance Request (DA Form 2407) clearly outlining the scope of the analysis desired, any special test to be performed on the exhibit and any direct questions desired to be answered.
- All maintenance historical records pertaining to the exhibit.
- Component Removal and Repair/Overhaul Form (DA Form 2410), if applicable.
- Information pertaining directly to the accident. The data contained in the crash facts message and a copy of the Equipment Improvement Report (EIR) will normally be sufficient information for a complete teardown analysis. The EIR (Maintenance Request, DA Form 2407) should be completed in accordance with TM 38-750, with all questions answered.
- Any photographs taken at the accident site that could be pertinent to the teardown analysis of the exhibit.
- Photographs and documentation of the disassembly if the exhibit was disassembled or any components removed prior to shipment.
- Any additional information which could assist in the performance of the teardown analysis (i.e., operation experience prior to failure, possible or suspected contributing factors and after-the-fact observations).

Shipping and Coordination

Shipping the exhibit to ARADMAC is normally done by the support activity having shipping capa-

Although not the cause of the accident, a teardown analysis investigation on this main transmission from a crashed UH-1M helped the accident investigation board determine the sequence of events prior to, during and after the mishap

bility. When available, military aircraft may be used for shipment to expedite delivery. When military aircraft are not available, or when it is not feasible to ship by military aircraft, coordinate with the appropriate accountable officer who will arrange shipment to ARADMAC. Shipping instructions should be clearly and permanently marked on the outside of the shipping container in accordance with AR 95-5. If proper shipping instructions are not on the shipping container, the exhibit may be misrouted and inducted into the regular overhaul program at ARADMAC. Shipping of exhibits for teardown analysis should be done on a priority basis by the most expedient means.

After the exhibit has been received for teardown analysis, ARADMAC will acknowledge receipt of the suspected item by message to the field unit/activity requesting the analysis. This message will include a forecast completion date. The Materiel Analysis Branch will assign the exhibit to a specialist in the field of analytical investigation. This specialist will be responsible for that specific project from receipt of the exhibit until the final report is written. He will also be responsible for any followup action taken on that project after the final report is completed (i.e., litigation). During his investigation and analysis, the specialist may need to coordinate his findings with the accident investigation board or contact the board for additional information about the accident. If the members of the board come up with additional information that could be pertinent to the analysis, this should be coordinated with the specialist assigned that exhibit as a project. This two-way coordination may be verbal, written or by message.

The Materiel Analysis Branch will provide an advanced brief of analytical findings as an interim or preliminary report as soon as possible. Additional information may be obtained by coordinating directly with the U. S. Army Agency for Aviation Safety (USAAAVS). The final written report is normally made within 30 days after receipt of the exhibit. If more time is needed for the teardown analysis, a revised forecast completion date will be sent to the accident investigation board. A copy of the final teardown analysis report is sent to the U. S. Army Aviation Systems Command (USAAVSCOM), USAAAVS, the applicable theater/Army aviation safety officer, applicable project officers, other services with same type aircraft, and the commanding officer of the field unit/activity that requested the analysis.

The aircraft accident investigation board may use the teardown analysis findings to establish factual data in order to analyze the total sequence of events prior to, during and after an aircraft mishap. The aviation safety officer may also use these analytical findings in his local safety education and prevention programs. If the procedures outlined in AR 95-5 are followed, along with the procedures previously mentioned in this article, the Materiel Analysis Branch of ARADMAC will be better able to give the aircraft accident investigation board a complete, comprehensive and factual report of analytical findings on the exhibit submitted for teardown analysis.

CW3 Jones, a senior aviator, is a graduate of the USC Aviation Safety Officers Course. Before his present assignment as aviation safety officer, 120th Aviation Company, Fort Richardson, Alaska, he was a teardown analysis and analytical investigation specialist with ARADMAC

If you have a question about personal equipment or rescue survival gear, write Pearl, USAAAVS, Ft. Rucker, AL 36360

PEARL'S

Personal Equipment & Rescue/Survival Lowdown

RESCUE RADIOS

THE SURVIVAL radio should be one of the most treasured possessions of an aircrewman's personal survival equipment. In Vietnam, this little gem saved the lives of many downed crewmembers. But just because we are no longer in Vietnam does not eliminate the need for an emergency radio. There are recorded cases of downed crewmembers in other than combat areas whose lives may have been saved had they been equipped with the proper survival equipment. So any time you plan to fly, make sure you have a workable survival radio—it could save your life if you should be unfortunate enough to need help.

Presently, there are eight types of survival radios used in Army aviation; however, this article is directed only to five types of radios most commonly used in the field today. While the characteristics (table 1) of the radios may vary, they are all small in size, simple to operate, and able to perform in varied and extreme environmental conditions, such as arctic cold and tropical heat.

AN/URC-10, AN/URC-10A and ACR RT-10. The AN/URC-10, AN/URC-10A and ACR RT-10 are subminiature radios designed to transmit and receive voice signals on frequencies 240.0 to 260.0 MHz. The transmitter also emits a tone-beacon signal for homing use, which can be manually locked in during unattended operation. Battery power for the AN/URC-10 is provided through an external battery connected to the radio by a waterproof cable, and for the ACR RT-10 and AN/URC-10A by an integral battery pack. Sixteen-volt dry batteries are used as the primary input voltage to the radio sets. The weight and size of all three radio sets are comparable in that each weighs 3.5 pounds and measures 36 cubic inches in size. These sets are simpler to operate than some of the other radios as they have only three controls—a tone button, a transmit lever and an antenna which acts as the ON/OFF switch. *The AN/URC-10A is operated exactly as the ACR RT-10 and AN/URC-10 except that the antenna cap must be unscrewed from the locknut before pulling the antenna out and the cap must be screwed into the locknut before closing the antenna back into the*

AN/URC-10A

ACR RT-10

AN/URC-68

USAAAVS

TABLE 1–Characteristics of Army Survival Radios

Radio Set and FSN	Battery Type and FSN	Other Components (Type and FSN)	Wt. (Lb.)	Frequency Range (MHz)	Power Output (mw)	Operating Temperature	Slant Range	Modulation
AN/URC-10 5820-858-5721	BA-1387/URC-10 6135-889-1485		3.5	240.0 to 260.0	200 min. carrier wave	-55° C. to +55° C.	Line of sight. Increases with receiver, e.g., 1,000 ft – 20 mi.; 4,000 ft – 50 mi.	Swept tone, CW, voice
AN/URC-10A 5821-134-5441	K-308A 6135-930-0810		3.5	240.0 to 260.0	200 min. carrier wave	-55° C. to +55° C.	Same as AN/URC-10	Same as AN/URC-10
AN/URC-68 5820-832-9158	BA-1112/U 6135-935-5241	Earphone Assembly H-281/URC-68, 5965-055-0648; Parachute Adapter Kit MX-8197/URC-68, 5020-791-1510	2.0 without Parachute Adapter Kit	VHF/FM (38.0 to 42.0) UHF/AM (230.0 to 250.0)	500 - FM 200 - UHF Freq. Control – Crystal	-40° C. to +55° C.	Line of sight. 20 miles	Voice, beacon, MCW
ACR RT-10 5821-912-4480	K-308A 6135-930-0810		3.5	240.0 to 260.0	200 average	-55° C. to +55° C.	Same as AN/URC-10	Same as AN/URC-10
AN/PRC-90 5820-782-5308	BA-1568/U 6135-838-0706		1.5 with battery	243.0 and 282.8	500 peak power in beacon mode	-30° C. to +50° C.	Voice – 60 nm 10,000 feet Beacon – 80 nm 10,000 feet ADF – 50 nm 10,000 feet	Voice, swept tone, CW

case. As with other radios, the range increases with altitude of the receiver, e.g., 1,000 feet—20 miles; 4,000 feet—50 miles. Applicable publications for these radio sets are TM 11-5820-640-15 and TM 11-5820-640-25P.

AN/URC-68. The AN/URC-68 radio set is a compact, simple-to-operate transceiver capable of transmitting beacon signals or providing two-way voice or modulated continuous wave (MCW) communications. The radio has four preset channels within the VHF/FM band of 38 to 42 MHz and four preset channels within the UHF/AM band of 230.0 to 250.0 MHz. Power output is 500 milliwatts (mw) for FM, 200 mw for UHF and crystal for frequency control. The range of the radio for line-of-sight operation is approximately 20 miles for homing and 10 miles for voice contact. The set consists of a receiver-transmitter unit with unit cover, an earphone assembly H-281/URC-68 and a removable battery BA-1112/U, which is attached at the rear of the unit by a single, slotted, captive screw. The battery will operate the set approximately 30 hours at 68 degrees or 15 hours at 32 degrees on a duty cycle of approximately 50 percent transmit and 50 percent receive. Battery life in the beacon mode is 18 hours. A parachute adapter kit MX-8197/URC-68 is also available with this set for aircraft units equipped with ejection seat survival kits. Total weight of the radio set without the parachute adapter kit is 2.0 pounds. TMs 11-5820-767-12 and 11-5820-767-35 apply to the AN/URC-68 radio set.

AN/PRC-90. The AN/PRC-90 is the most recently procured survival radio, which began to reach the field in January 1974. With the mercury battery, it weighs 1.5 pounds, occupies about 23 cubic inches and is factory-set to transmit on the 243.0 MHz military distress frequency, an emergency beacon swept-tone signal and a modulated continuous-wave (MCW) signal. The set also provides two-way voice communication on specific crystal-controlled frequencies of 243.0 and 282.2 MHz. Based on line-of-site operation, it is estimated that it can transmit a beacon tone for over 85 miles and voice contact for about 10 miles. Battery operating temperature is —30 degrees C. to +50 degrees C. and the battery will operate the beacon for 18 continuous hours at 25 degrees C. with a power output of 325 milliwatts (minimum) or 10 hours at —10 degrees C. Although this radio presently does not provide a signal for the FM homing equipment in Army aircraft, plans are in the offing either

AN/PRC-90

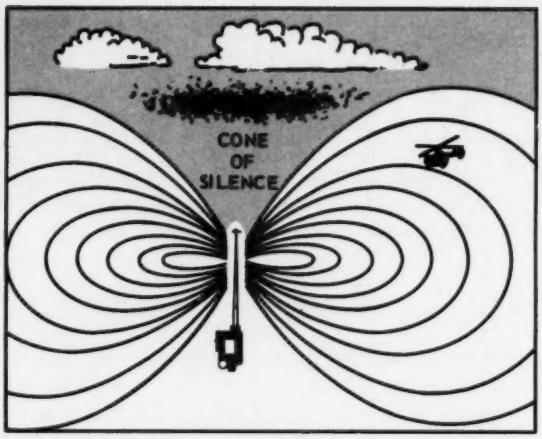


FIGURE 1—Antenna pattern for URC-10 (RT-10) survival radio

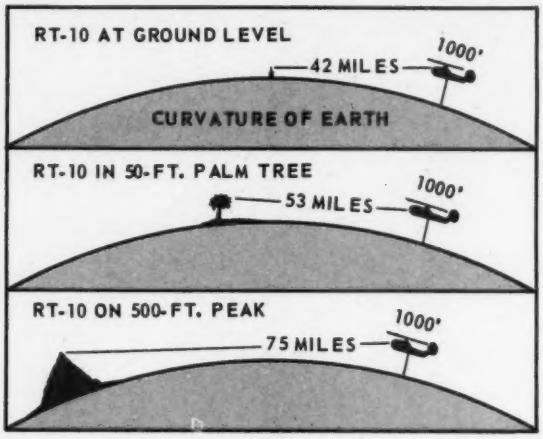


FIGURE 2—"Line of sight" transmission

to add FM to the radio or the UHF DF capability in Army aircraft. The set comes with an optional earphone and has a flexible rubber-covered antenna which can be stowed by bending the antenna around the set and latching it into a retainer. The radio is hermetically sealed and is capable of operation after immersion in 50 feet of water.

Design slant range is 60 nm at 10,000 feet for voice contact, 80 nm at 10,000 feet for the beacon signal and 50 nm at 10,000 feet for ADF.

Applicable publication for the AN/PRC-90 is TM 11-5820-800-12, which was published in December 1973.

To achieve maximum performance of survival radios, crewmembers must be familiar with their capabilities and limitations. Using the RT-10 as an example, let's look first at how it sends out a signal. Figure 1 shows the transmitting pattern of the antenna. Note that its ultra-high frequency emission is in kind of a doughnut pattern. This means that the radio best performs with the antenna at a right angle to the ground. Also note that this can cause decreased transmission efficiency directly over the tip of the antenna, perhaps even a cone of silence like navigational radio ranges. So when using the radio, KEEP ANTENNA STRAIGHT UP, rather than pointing it at the rescue aircraft.

The signal pattern of the RT-10 UHF transceiver is line-of-sight (figure 2). A downed crewmember betters his chance of having a signal picked up by increasing the height of the radio antenna. For example, with the rescue aircraft at 1,000 feet, transmission from the ground has maximum contact range of 42 miles; with an antenna height of 50 feet, the contact distance stretches to 53 miles; at 200 feet, the range increases to 62.5 miles. These distances are based on maximum battery power but emphasize the value of increasing the height of your transmitting location.

In a hostile environment situation, however, you might not want to compromise your concealment, secure location, etc. It would then be best to find high ground or even to climb a tree. Remember, you can buy roughly another 5 miles of transmitter pattern with every 50-foot increase in antenna altitude.

Two other major factors which influence the transmitting range are battery power and the physical condition under which you are transmitting. For instance, the radiating power of the RT-10 is 200 milliwatts. At this power, you can expect at least 50 operating hours at 80 degrees F. when alternately transmitting one-half hour and receiving one-half hour. Cold temperatures affect the power and life of the radio battery. This can be remedied, however, by placing the battery or the entire radio inside your flight clothing on a warm area of the body. If the radio signal has to pass through solid or partially solid objects, such as mountains and trees, transmitter power and range is decreased. It is best then to transmit from a relatively clear area when on the ground to ensure better operation.

The final factor is that radio transmission is more rapidly identified by the receiver, more easily recognized as a distress signal and much more easily homed in on when the radio is operated in the "swept tone." A rule of thumb is to use this mode until you have the rescue aircraft in your sight.

As a point of interest, survival radios are not supplied with the survival vest. Their basis of issue is your unit TO&E or TDA.

MAST MUSTs

mission uniting supervision and training

Major John D. Colvin III
Directorate for Education and Prevention

USAAAVS

MAST MUSTs

ONE OF THE MANY significant military efforts in the Republic of Vietnam was that of the medical service. The resources devoted to the individual soldier's medical needs surpassed any similar effort in history and were more effectively used than ever before.

Addressing the 1972 meeting of the AAAA, General Creighton W. Abrams had this to say about Dustoff—a term used to describe the helicopter ambulance units carrying out the tactical aeromedical operations in Vietnam: ". . . a special word about the Dustoffs—the medevacs . . . Courage above and beyond the call of duty was sort of routine to them. It was a daily thing, part of the way they lived. That's the great part and it meant so much to every last man who served there. Whether he ever got hurt or not, he knew Dustoff was there. It was a great thing for our people."

Early in 1970, the Department of Defense said that a ready-made force of these well-trained and experienced paramedical personnel was available due to the winding-down of the war in Vietnam. It was suggested by the Secretary of Defense that these medics and helicopter crewmen might be used to fill a nationwide need for qualified rescuemen. Four months later, MAST was born.

MAST, an acronym for Military Assistance to Safety and Traffic, is intended to bring to civilian life the techniques which saved so many lives in Vietnam: rapid transport of the injured to a hospital with competent medical treatment en route.

In July, August and September of 1970, Army MAST test programs were set up at three posts—Fort Sam Houston, Fort Carson and Fort Lewis. All three of these pilot projects still exist. They have been highly successful and well received by the communities they serve. (See "MAST Is," November 1973 AVIATION DIGEST.)

Last year the Congress approved the MAST program as an amendment to the military procurement authorization bill for FY 1974 and the President signed it into law. This will significantly expand the MAST program and many commanders may soon have the added responsibility of operating a 24-hour-a-day, 7-day-a-week helicopter ambulance service. One of the major problems will be that of getting the job done safely. This will require careful and thorough planning beginning with an understanding of the mission—the first MAST "MUST."

MAJ Colvin, who served as an evacuation pilot, operations officer, and commander of a medical detachment during three tours in RVN, is now an instructor, Officer Instructional Division, and the USAAAVS MAST Project Officer for Safety. He attended the Command and General Staff College at Ft. Leavenworth and formerly instructed at the Medical Field Service School, Ft. Sam Houston. Since his assignment to USAAAVS, MAJ Colvin has visited or coordinated with all three Army MAST test sites and with many commanders who will be responsible for implementing this program at their installations

MISSION. The MAST program provides helicopter ambulances, crews, medical personnel and equipment and supplies in a continuous state of readiness. It does not compete with civilian services and is used *primarily in true emergency situations* when ground transportation is not feasible.

Originally started to provide fast medical care to highway accident victims, MAST operations at Army test sites quickly expanded to respond to any type of serious civilian medical emergency. The Army regulation covering MAST, still in draft form at this writing, defines serious medical emergencies as situations where an individual's condition requires air-evacuation to a medical center as soon as possible to prevent death or aggravation of injuries or illness. In addition, MAST units also perform inter-hospital transfer of critically ill patients, premature infant transfer, and pickup and delivery of urgently needed blood, medicine and human organs for transplant. The most important single MAST success factor—according to a study of the test program—is the ability to respond to calls for assistance around the clock. This is accomplished as part of the units' continued training programs, the idea being that these units would be performing productive work in addition to their normal training requirements. This has become possible—and more essential for maintaining aeromedical proficiency—since the end of the war in Vietnam.

Although the Army has traditionally responded to civilian emergencies, this assistance has previously been on an individual basis with no detailed prearranged plan or procedures. MAST—designed to fill a void until a similar civilian service can be developed—brings together the resources and experience of the military with civilian Emergency Medical Service (EMS) systems in a joint mission. Obviously, the success of this mission will depend primarily on coordinating and uniting military and civilian operations—the second MAST MUST.

UNITING. Since civilian EMS systems vary greatly around the country, no one operating procedure could possibly be developed to fit all

Originally started to provide fast medical care to highway accident victims, the MAST mission has expanded to respond to any type of serious civilian medical emergency

MAST success depends on uniting the resources and experience of the Army and civilian Emergency Medical Service systems in a coordinated operation

the circumstances of the different areas served by MAST. This must be accomplished by uniting the civilian and Army communities through a local MAST coordinating committee.

Committee members should include representatives from the local military activities, civilian ambulance services, medical facilities, hospital associations, health department, local government, law enforcement agencies and other health-oriented organizations. The proficient organization and leadership of this group will have a direct bearing on the success of MAST efforts. The day-to-day planning and operation of the program is the responsibility of this committee.

Since there will be difficulties requiring immediate attention which cannot be anticipated even by the most efficient planners, the committee must designate one civilian member who is authorized to take action through the committee in resolving local problems. This coordinator must be readily accessible to his Army counterpart, who will inform him of daily operational problems—even those resolved successfully by the military—as they come up. This close coordination will provide a single point of contact for the military and eliminate many situations which could become flight safety hazards or prove to be detrimental to patient care.

Civilian education and public information is also a responsibility of the local committee. After watching TV programs based on rescue squads, millions of Americans may think their local MAST units can do everything. This is not the case. A complete explanation of the capabilities and limitations of the MAST program should be publicized through all available news media, civic groups and professional organizations. This should be a continuing education program

MAST MUSTs

with emphasis on types of patients normally evacuated and emergency medical treatment administered en route, as well as aircraft operating characteristics and flight procedures.

In addition, two areas vital to mission success—communications and landing site requirements—deserve special attention by the coordinating committee.

The local community provides approved helicopter landing sites at or near participating hospitals and all radio equipment necessary to alert the MAST unit, gives en route and pickup site information and provides consultation with the destination hospital. This communication network must provide direct linkage between the hospitals, helicopters, highway patrol, local police, ground ambulances and military communication centers.

The work of the local coordinating committee is twofold: It provides for the smooth daily operation of MAST and prepares the civilian community to assume full responsibility for the program in the event of withdrawal of Army support due to defense priorities.

The real key to accomplishing both these ends is supervision—the third MAST MUST.

SUPERVISION. Supervision, unlike the mission and uniting efforts associated with MAST, is not unique for aeromedical or other aviation units. The risks or hazards linked with MAST do not greatly outweigh those found in other aviation operations. Why then is supervision included as one of the MUSTs? Simply said, the unique ingredient in the MAST operation, which dictates closer supervision, is the desire of crews to accomplish their missions out of concern for the urgent condition of their patients.

Most MAST missions will be performed under normal or desirable flight conditions—in situations under which routine supervision will be effective. The additional effort from the supervisor becomes a MUST when the go-no-go decision (accept, delay, abort or reject) has to be made for less than desirable flight conditions. The extremes of the trade-off become: attempt the mission, which might result in loss of crew and aircraft, or delay, abort or reject the mission and have these resources available for a significant number of missions in the future. As stated, these are the extremes but it must be realized that the reputation and experience acquired by the medevacs in Vietnam did not come without a price—a price dictated by combat which can be avoided when MAST mission accomplishment is combined with full consideration for safety.

Who are the supervisors carrying this additional responsibility? Certainly, any individual who has charge of others is a supervisor. However, the individual we're specifically addressing here is the

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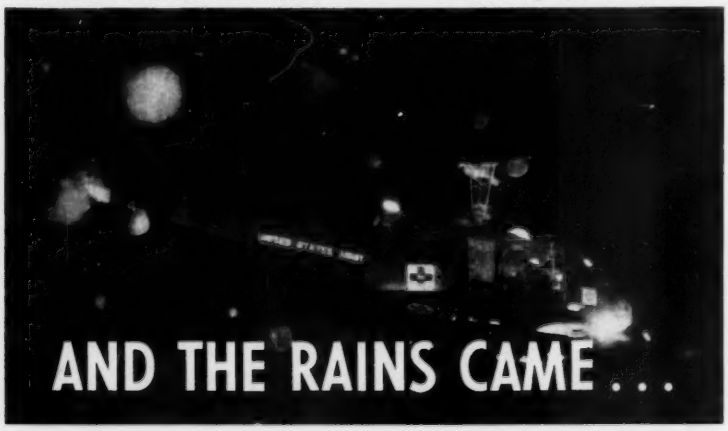
The importance of carefully and thoroughly uniting military and civilian operations—the second MUST for MAST—is shown in this account of a recent MAST operation

Lieutenant Daniel W. Gower Jr. *507th Medical Company (Air Ambulance)*



AND THE RAINS CAME . . .

THE RINGING OF the red "hot-line" telephone on the RTO desk shattered the early Sunday morning quiet of the 507th Flight Operations Ready Room on 15 July 1973. The previous days had been dark and rainy, and this morning was no exception. A stationary front lingered, bringing more rain. The Texas Department of Public Safety was on the phone, asking for help in rescuing people stranded by rising water in the San Antonio area.

Immediately the flight crews of the MAST (Military Assistance to Safety and Traffic) unit—the 507th Medical Company (Air Ambulance)—loaded their rescue helicopters with water wings, rescue nets and jungle penetrators and set about the job of lifesaving. The

MAST commander. He is the one who must ensure, through his supervisory efforts, that his unit's aircraft are being operated as they were designed to be and that his aircraft crews and all other unit personnel are fully aware of his command policies and philosophies toward mission accomplishment. On the receiving end of command communications, he must thoroughly understand his men and how they are affected by a 24-hour-a-day alert status, as well as their desire to accomplish these lifesaving missions. Above all, the MAST unit commander must be available to assist in making the go-no-go decision when less than desirable conditions prevail.

Complete training is required for medical aidmen as well as flight crews. Where possible, they should gain practical experience in the emergency room of the post hospital

One of the most effective tools the commander has at his disposal to ensure that his policies and philosophies permeate his entire unit is the training his personnel receive—the last MUST.

TRAINING. As mentioned earlier, the addition of MAST to a unit's mission allows that unit to accomplish its training while performing a vital service. However, a significant amount of special qualification training must be accomplished *before* an individual (any crewmember) becomes directly involved in MAST operations. In addition to being fully qualified in all normal and emergency aircraft procedures, his training must give him a complete knowledge of the MAST environment and procedures before he is called on to perform lifesaving missions.

One training subject, in addition to those affecting all Army aviation units, is that of landing sites. Crews must acquire a knowledge of all known landing sites throughout the MAST unit's area of operation. This knowledge must be gained through the practical experience of landing and taking off from the sites, both under day and night conditions, until the required level of proficiency is reached. Recommended aids to assist in this training are reference diagrams and

Hueys of the 507th were to be in the air 20 of the next 36 hours, flying 90 people to safety and aiding in locating many others for rescue by boat and other means.

The first bird in the air met bad weather and the pilots had the good sense to return home, but the second, departing 2 hours after the call for assistance, succeeded in locating a family cut off by water, only to have them refuse to leave. They were evacuated later the next day after they ran out of food and water.

The 507th flew two other missions that afternoon before dark. Meanwhile, it rained, brooks grew into rivers and the Medina River became a raging torrent, wiping out everything in its path, including one entire trailer park. But the men in the MAST helicopters plucked 17 people from trees and rooftops.

Then, at 2345 hours, the Texas Highway Patrol, communicating with the helicopters by means of FM radios, directed CPT Edward A. MacDonald and CW2 Joseph M. Chra to an area where several people were believed to be clinging to the tops of trees in danger of swift currents. The crew spotted a young couple hanging onto small trees nearly covered by water. During attempts to hoist them into the helicopter by use of the jungle penetrator, the woman fell off the tree three times, and the man floated downstream to a larger tree. Realizing the woman was almost exhausted and could not hold on much longer, SGT Richard C. Schwartz, the crewchief, inflated his water wings and jumped in the water to help. As he reached the victim, brush punctured his water wing. SGT Schwartz started downstream with the girl toward an island in their path but a stronger current pulled them in a different direction. He was barely able to stay above water because of the weight of the water wings, so he pushed the now very weak girl into a large tree. Then he cut himself free of the water wings with his survival knife and found safety in a tall tree.

In the meantime CPT MacDonald had landed on the island. SP4 Roy De La Vega, the medic, spotted SGT Schwartz and the girl. They marked the island with CPT MacDonald's strobe light so that the highway patrol could find it.

MAST MUSTs

photographs depicting the best approach and departure routes, site elevations, potential hazards (powerlines, flagpoles, etc.) and en route landmarks. These aids could be enclosed in a binder that would serve as an invaluable information refresher for future missions.

Another area requiring increased training emphasis is the instrument program. Instrument flying proficiency will no doubt determine the success of many missions. In addition to training in basic instrument flying (to include initial issue and renewal of instrument tickets), each aviator must be thoroughly familiar, through experience, with all of the instrument facilities that he may be called upon to use. To meet this end, IFR training missions should be performed throughout the MAST area of operation using all available instrument facilities. This will ensure familiarity with these facilities when the need to use them arises.

Complete training is also required for the medical aidman and crew chief. Military medical personnel participating in the program will be trained to meet at least the minimum level of proficiency recommended by the National Academy of Science in the Basic Emergency Medical Technician-Ambulance Training Course published by the Department of Transportation. Personnel of the civilian EMS system should provide military medical aidmen any further training required to ensure a coordinated and proficient working relationship with civilian hospitals. In addition, a continuous training program for all military and civilian personnel participating in MAST operations must include flight operations, capabilities and limitations of military helicopters, loading and unloading procedures, safety precautions, use of emergency and special medical equipment, communications, and procedures for administering emergency medical treatment. Where possible, the aidman should receive practical experience in the emergency room of the hospital serving his military post. In areas where team effort is necessary, the crew chief should be trained to assist the aidman in providing en route emergency medical treatment.

Use of the internal rescue hoist requires the utmost in knowledge of operational procedures and entire aircraft crew coordination. These requirements can be met only through experience acquired by training.

Orientation classes should be conducted by the MAST unit to train local law enforcement personnel in helicopter procedures, communications and signals, crowd control, and en route information needed by flight crews concerning hazards, wind and weather at pickup and landing sites.

AND THE RAINS CAME

Short of fuel, the crew wisely left the area and returned home. Later, the highway patrol notified MAST headquarters that all were safe and on their way home aboard the backup bird. SGT Schwartz returned to duty after a change of clothes. Five days later he was transferred to the U. S. Army Aviation School at Ft. Rucker, AL, to become a warrant officer flight candidate. He has been recommended for the Soldier's Medal for his unselfish act that night.

The Monday morning officer's call of 16 July was far from normal. There were briefings on a new UH-1 rescue net brought up from Corpus Christi, TX, on Saturday, and additional helicopters to rig

The MAST unit commander must understand the crews' desire to accomplish their missions and be available to assist in making the go-no-go decision when less than desirable conditions prevail

Each aspect of the training program, including unit SOP, command philosophies, and procedures required by regulation, must be planned in detail and professionally executed. Shortcircuiting any phase of the training program carries a high potential for undesirable results when future missions include the patient in a real emergency situation.

The operation of MAST presents an opportunity to draw upon the experience of the past in providing a service for the future. The experience examined must include not only past success and praise but the reasons for failure. In planning for MAST, an excellent opportunity exists to capitalize on what has been learned up until now, including not only Vietnam, but the test program as well. With exception of the test units, all units to receive the MAST program have a chance to be prepared for the mission when the signal is sounded. Application of the MAST MUSTs will provide a basic foundation from which a unit can build toward operating with a high degree of certainty that its missions will be accomplished with accident-free performance.

and preflight. There was also the anticipation of who would get to fly and who would be unfortunate enough to draw ground duty. As soon as the early morning fog and rain ended, the rescues were resumed. The highway patrolmen on the scene provided vital information to the crews in the air much as a pathfinder would in combat operations. The successful efforts of the pilots and crews were due in large part to the work of the highway patrol in accurate and timely spotting of the victims. Before dark that night, 70 more civilians had found safety aboard MAST helicopters.

The men of the 507th learned at least three lessons as a direct result of these missions. First, and most important, survival gear is vital even in Continental United States. Had SGT Schwartz not had his survival knife he easily could have drowned. The strobe light carried in the pilot's survival vest proved its worth that night. Second, proficiency pays off when the chips are down and so are the ceilings. More than once the fog banks moved in on the crews, and the time the pilots had spent in instrument flight training proved its value. Third, we learned that crews in the air are often only as useful as the ground crews supporting them. The 507th was a link in the chain of agencies welded to balance mission accomplishment with full consideration for flight safety.

A recent editorial in the *San Antonio Express* sums up what cooperation among MAST units and other agencies can mean to people in need:

"This has been a year of rising water in the San Antonio area. Record rains repeatedly have driven creeks and rivers out of their banks, threatening lives and property. Help has come from Army MAST helicopters, police, firemen, sheriff's officers, the National Guard, Civil Defense workers and individuals. These agencies and private citizens were prepared to risk their own lives to save others. When calls for help came they answered. San Antonians and South Texans can be grateful."

It makes it all worthwhile.

USAASO Sez

The U. S. Army Aeronautical Services Office discusses

Fly only necessary missions.

Use other means of transportation when appropriate.

Equalize pilot time in mission assignments.

Link—to maintain procedural proficiency.

Economize power settings where applicable.

Combine missions where possible.

Observe good maintenance management practices.

Navigate most direct, economical, VFR route when choice is available.

Obtain IFR clearance and release time before taxi and runup.

Maximize training benefits of mission assignments.

You must help.

☆ U.S. Government Printing Office 1973—748-161/5

WOSC Begins

The Warrant Officer Senior Course (WOSC) officially gets underway this month at the U. S. Army Aviation School at Ft. Rucker, AL. The new course is open to senior warrant officers in all branches.

Competition is high among those eligible to be selected for the course, which provides the highest level of professional military education available to warrant officers. Of 592 senior warrant officers eligible to attend the first class, 100 were selected.

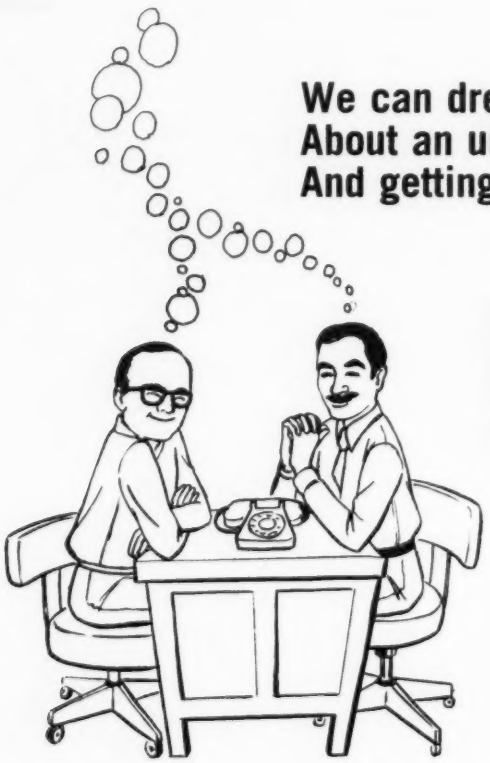
The Aviation Warrant Officer Career Course provided the nucleus of the academic program of instruction; in addition, a new program of instruction has made the course branch immaterial.

The Aviation Warrant Officer Advanced Course, also taught at Ft. Rucker, is the new name of the second level of warrant officer professional military schooling, replacing the intermediate course. While these changes are realities at the Aviation School, warrant officer advanced courses for other branches are programed for Ft. Bliss, TX; Aberdeen Proving Ground, MD; Redstone Arsenal, AL; Ft. Gordon, GA; Ft. Belvoir, VA; and four other planned sites to be announced.

One of the important features is that sites for the new courses were selected so that students could enroll in nearby cooperating civil institutions allowing them the opportunity to work toward associate or baccalaureate degrees.

For those not fortunate enough to be able to attend the resident WOSC or advanced courses the Department of Army-Wide Training Support at the Aviation School can offer correspondence courses that parallel the residence courses.

We can dream
About an unlimited staff
And getting out to talk to all of you . . .



But, until
Dreams come true
We must depend on you

Please help by filling out the questionnaire on page 1 and mailing it to us